

Why the Fed had to act as Global Lender of Last Resort:  
a systemic 'bank run' in shadow banking

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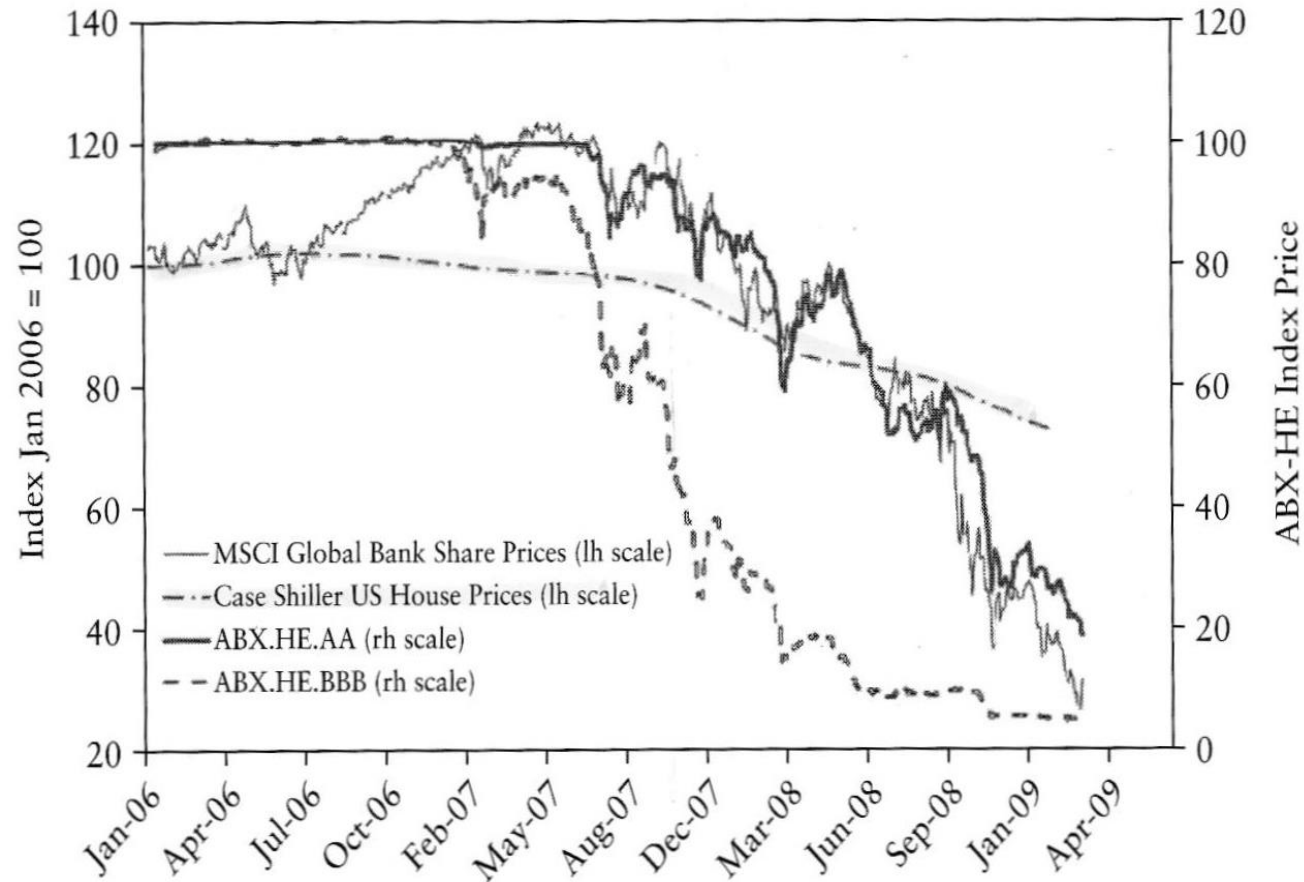
# Outline of talk

- Alex Karalis has discussed how **Commercial Banks** can – by ‘maturity transformation’ - provide liquidity insurance; but they are exposed to collapse if there is a ‘bank run’ with depositors rushing to withdraw.
- Here the focus is on **Investment Banks** who get funding in wholesale markets and invest - not in illiquid loans - but in **marketable** risky assets (like packages of dicey ‘subprime’ mortgages)
- We focus on two key features of these so-called ‘shadow banks’:
- How ‘marking the value of these risky assets to market’ leads to **amplification** of news about asset quality, good or bad.
- How bad news can – in addition - lead to the equivalent of a bank run, **financial panic** threatening a repeat of the Great Depression.

## Background: ‘Dynamic credit enhancement’

- Instead of taxes and subsidies to redistribute income, the idea of ‘dynamic credit enhancement’ in the US was that those on lower incomes would **borrow to get on the housing ladder** so that – with time and house price appreciation – they could extract equity to increase consumption. But:
- But, as Holmstrom (2009) put it, the blunt fact of sub-prime financing is that ‘ the dynamic credit enhancement model **only worked as long as house prices were rising**’. So when the housing bubble burst it was almost inevitable that banks heavily invested in such products would be in serious trouble – either because they held as assets which were call-option style products collapsing in value; or because of a roll-over crisis.
- However, ‘as money from the government-sponsored agencies flooded into financing or supporting low income housing, the private sector joined the party [and] converted the good intentions behind the affordable housing mandate and the push towards an ownership society into a financial disaster.’ Rajan (2010, p.38, 9)
- On comparing Wall Street in 2007-9 with Wall Street in 1929: “It’s like *deja vu* all over again.”

# Fall in value of Mortgage Backed Securities and house prices (indices for both AA and BBB on rh scale) Milne(2009)



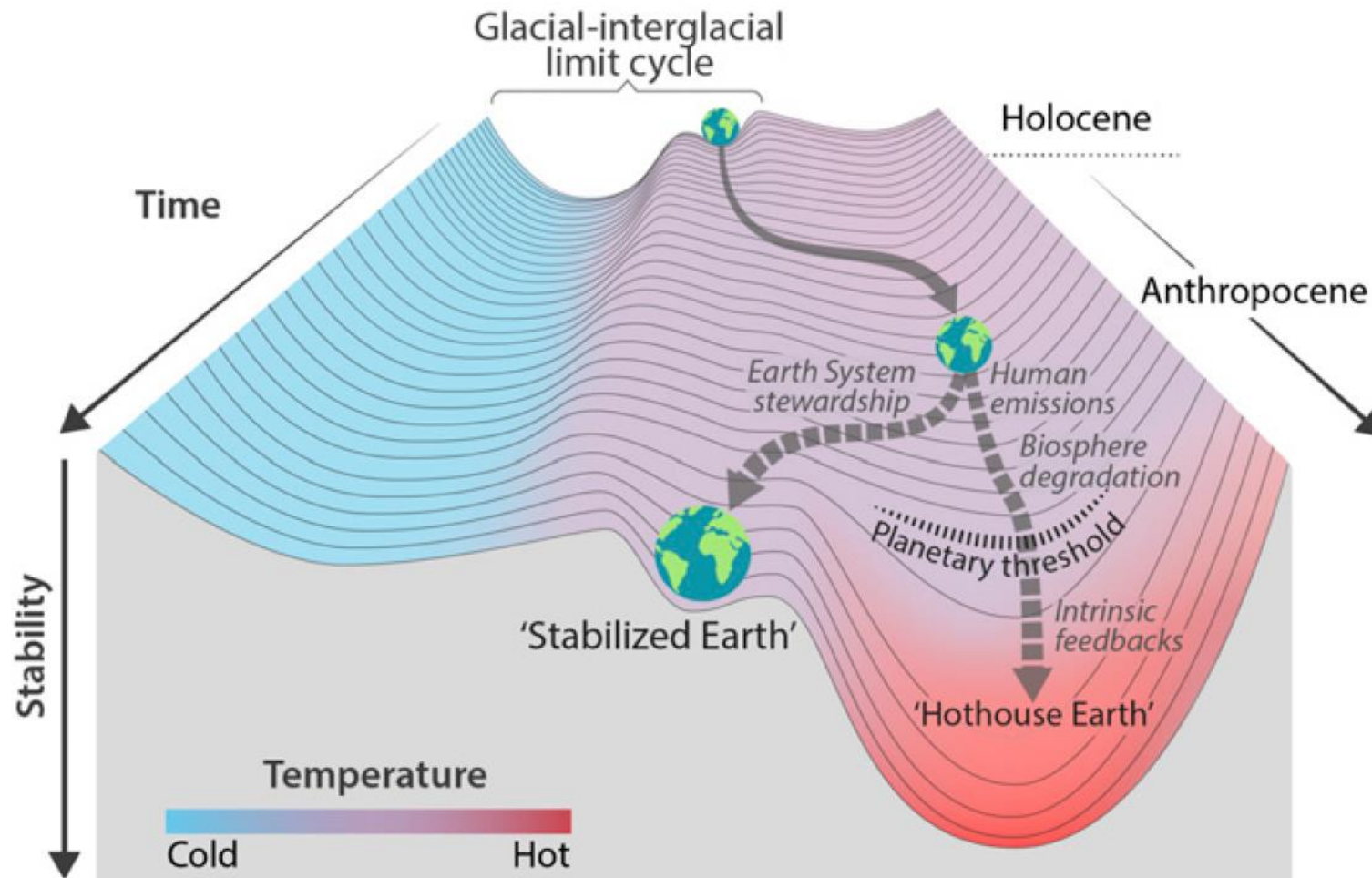
## Ben Bernanke(2018a) on ‘financial panic’: how wholesale funding dried up on ‘bad news’ about asset quality

- ‘Before the crisis, investors (mostly institutional) were happy to provide **wholesale funding**, even though it was not government insured, because such assets were liquid and perceived to be quite safe.
- Banks and other intermediaries liked the low cost of wholesale funding and the fact that it appealed to a wide class of investors.
- Panics emerge when **bad news** leads investors to believe that the “safe” short-term assets they have been holding may not, in fact, be entirely safe. If the news is bad enough, **investors will pull back from funding** banks and other intermediaries, **refusing to roll over their short-term funds** as they mature.
- As intermediaries lose funding, they may be forced to **sell existing loans** and to stop making new ones. ...[so] the cost of financing any project will spike, slowing the economy.’

# 1. 'Amplification effects' in global Investment Banking (IB) due to changes in the price of risky assets

- The Value at Risk (VaR) rules of BASEL II sought to ensure that each **individual** bank had sufficient 'own equity' funding to cover (almost) all downside risk on assets in its portfolio: so creditors' funds would be safe
- But this ignores the 'amplification effect' of news on asset quality. Thus Good News regarding risk assets which generates **price** changes will – with 'marking to market' – increase the value of assets relative to liabilities, i.e. boost IB equity; and fuelling further expansion. (Same applies - in reverse - for Bad News.)
- So the BASEL regime was unstable - especially as the Credit Rating Agencies gave top notch ratings to begin with, which later turned out to be 'fake news'.
- Problem here is the existence of an 'externality'.
- Before looking at this one, consider another 'externality' example: global warming.

Global Warming and emergent dynamics:  
will 1.5~2 degrees C above preindustrial be a stable equilibrium - or not?



Source:  
Steffen et al. (2018)  
'Trajectories of the  
Earth System in the  
Anthropocene'

Two aspects of Investment Banking (IB) behaviour to be examined

## **Boom**

As IBs had high debt/equity ratios , **Pecuniary Externalities** played a key role, with shocks to asset quality being greatly amplified by **effects on equity**, despite the VaR rules – designed to ensure prudential behaviour of *individual* banks. To analyse this we look at the Shin model, Shin(2010), Adrian and Shin(2011)

## **Bust**

**Financial Panic** on Wall Street: funding through money markets needs rolling over - which can quickly dry up on Bad News, as Bernanke(2019a) points out.

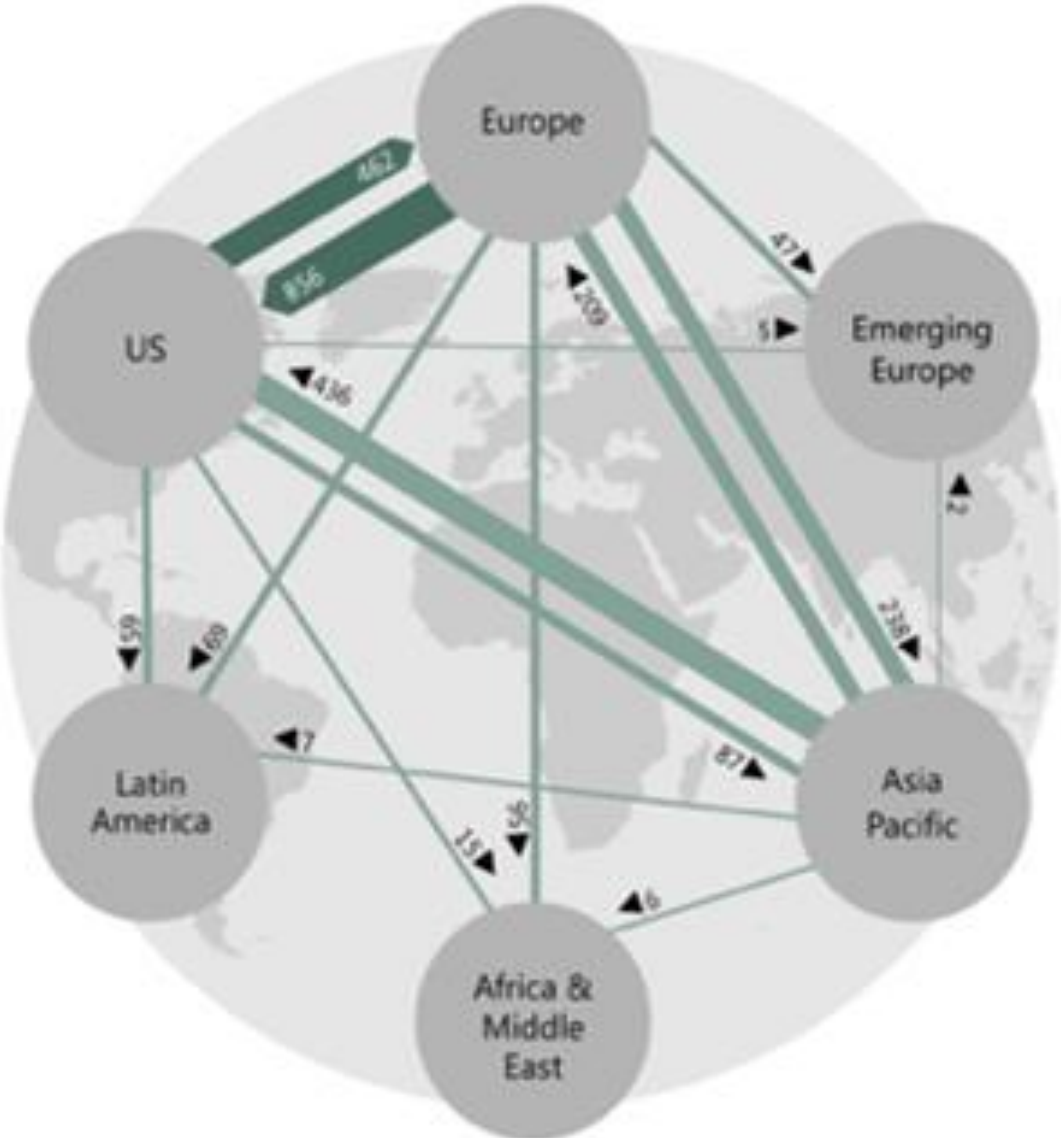
**Key idea:** to *incorporate Diamond-Dybvig style panic into the Shin model*, so financial collapse ‘emerges’ after aggressive risk-taking comes unstuck.

(Here we don’t go on to link this to the real economy: but see Bernanke, 2019b)

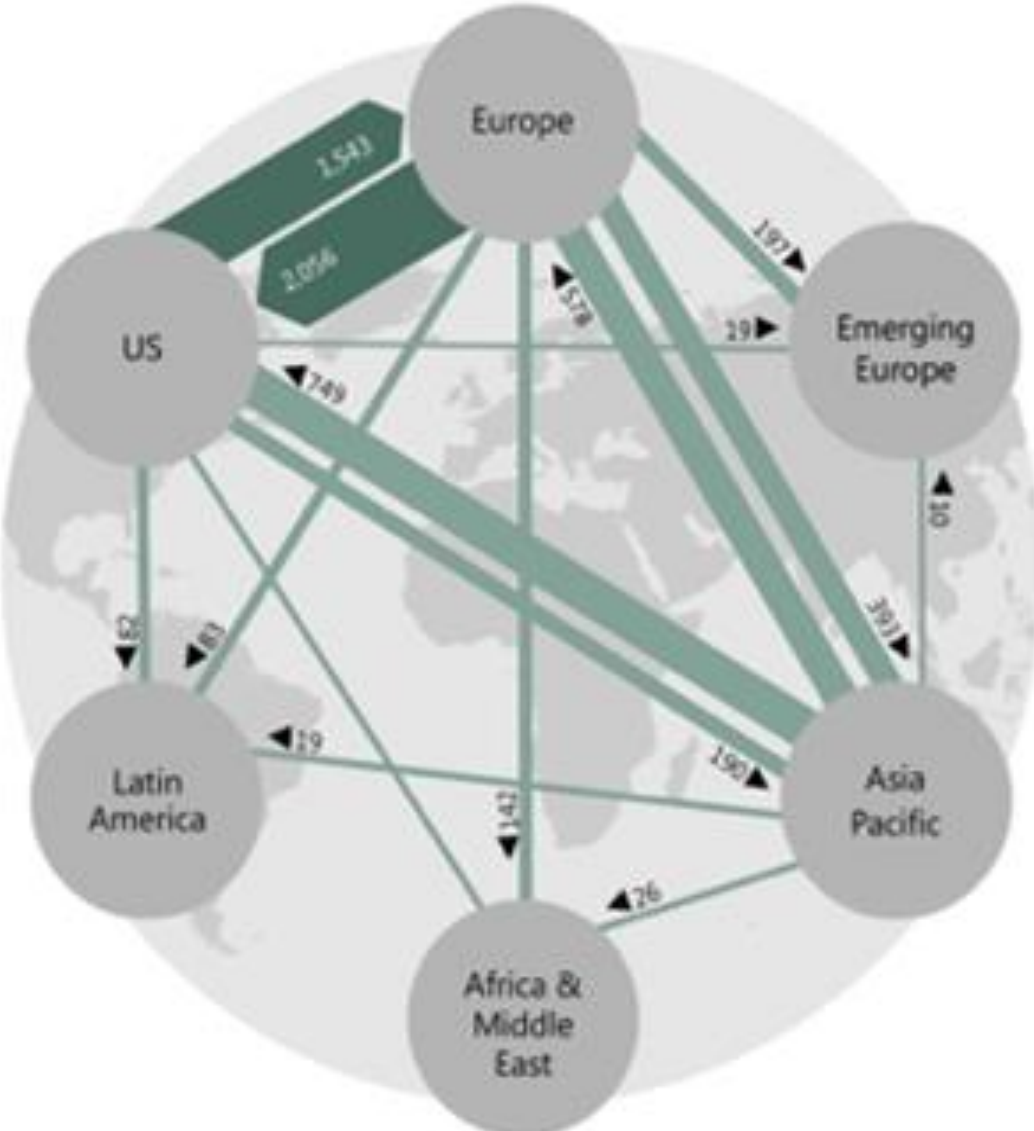


Financial Globalization merry-go-round: +\$1.1tr Atlantic round-trip.  
 But where will Europe get \$\$ if there's a panic failure of funding?

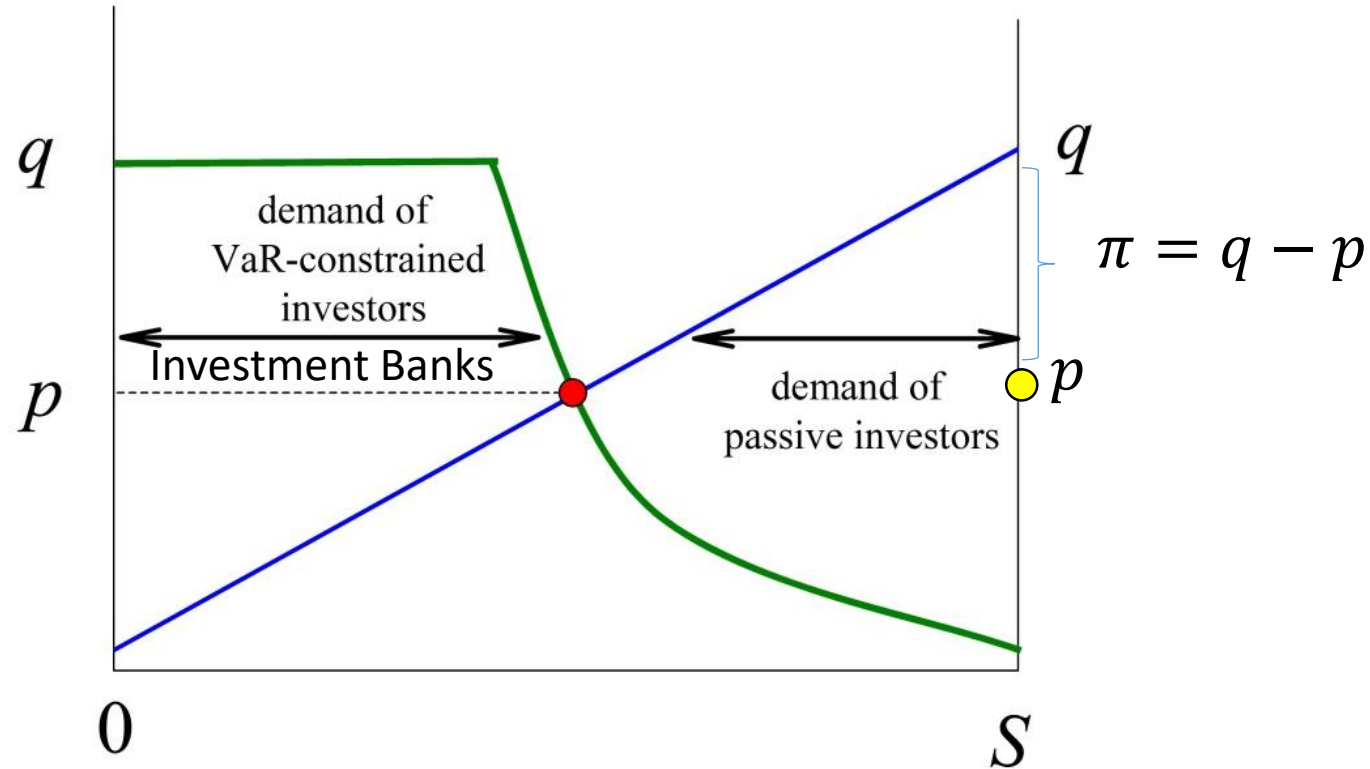
2002



2007

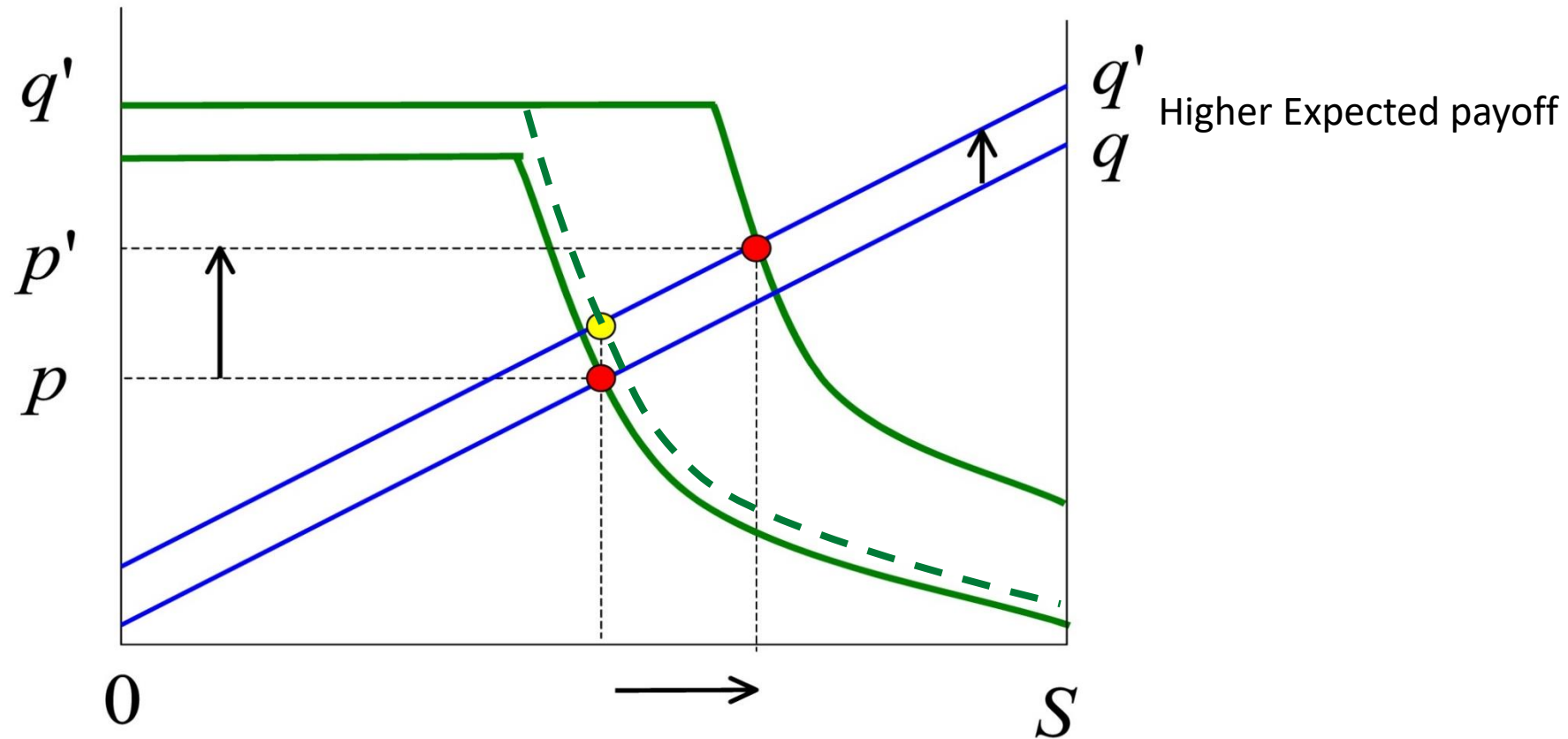


# Shin's model of two-sector demand and a fixed supply of risky assets (price $p$ , expected payoff $q$ , risk premium $\pi = q - p$ , total supply $S = 1$ )



The horizontal part of the demand curve by Investment Banks reflects their 'own equity': a higher level of equity invested will shift demand to the right, raising  $p$  and reducing  $\pi$

**BOOM: Good News shock in Shin's model** (here a higher expected payoff):  
**Immediate effect** - both demand curves shift up, raising price, no change in risk premium



**In equilibrium**, Investment Banks **respond much more** as the price rise increases their equity and allows for expansion, a so-called **Pecuniary Externality**

## Algebraic treatment of Shin model: initial equilibrium

$$(1) \quad x = \frac{3\tau}{z^2} (q - p) = \eta \pi \quad \text{Risk-averse demand by pension funds, etc}$$

where  $\pi = q - p$  denotes the risk premium.

$$(2) \quad y = \frac{e}{z - (q - p)} = \frac{e}{z - \pi} \quad \text{Risk-neutral, VaR constrained, demand by IBs}$$

$$(3) \quad y + x = 1 \quad \text{Market clearing}$$

**Initial equilibrium:** derive quadratic in  $\pi$  on LHS and  $e_0$ , IB equity, on RHS:

$$(4) \quad \eta\pi^2 - (1 + \eta z)\pi + z = (\eta\pi - 1)(\pi - z) = g(\pi) = e_0$$

with roots  $\pi = z, \pi = \eta^{-1}$  where  $z < \eta^{-1}$ , see Figure above.

## Good news on asset returns: shifts the Equity equation, given $g(\pi)$

With allowance for 'mark to market' accounting, the **initial equilibrium** may be rewritten with an Equity valuation equation  $e(\pi)$  on RHS

$$(5) \quad g(\pi) = e(\pi) = e_0 + (\pi_0 - \pi)y_0$$

where  $g(\pi)$  is defined in (4).

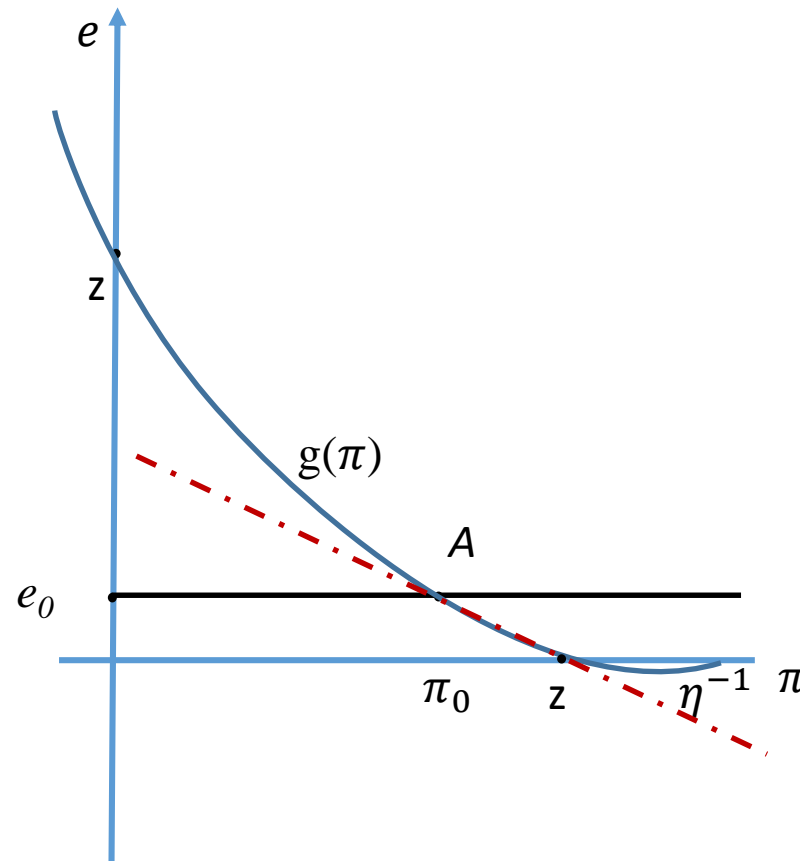
**Equilibrium after a Good News shock** ( $dq > 0$ ) may be captured - to a first approximation - by adding  $dq y_0$  to the RHS of equation (5) to yield:

$$(6) \quad g(\pi) = e_0 + (dq + \pi_0 - \pi)y_0$$

where the first additional term  $y_0 dq$  is the initial capital gain and the second  $(\pi_0 - \pi)y_0$  measures the subsequent **pecuniary externality**, as determined by solving equation (6).

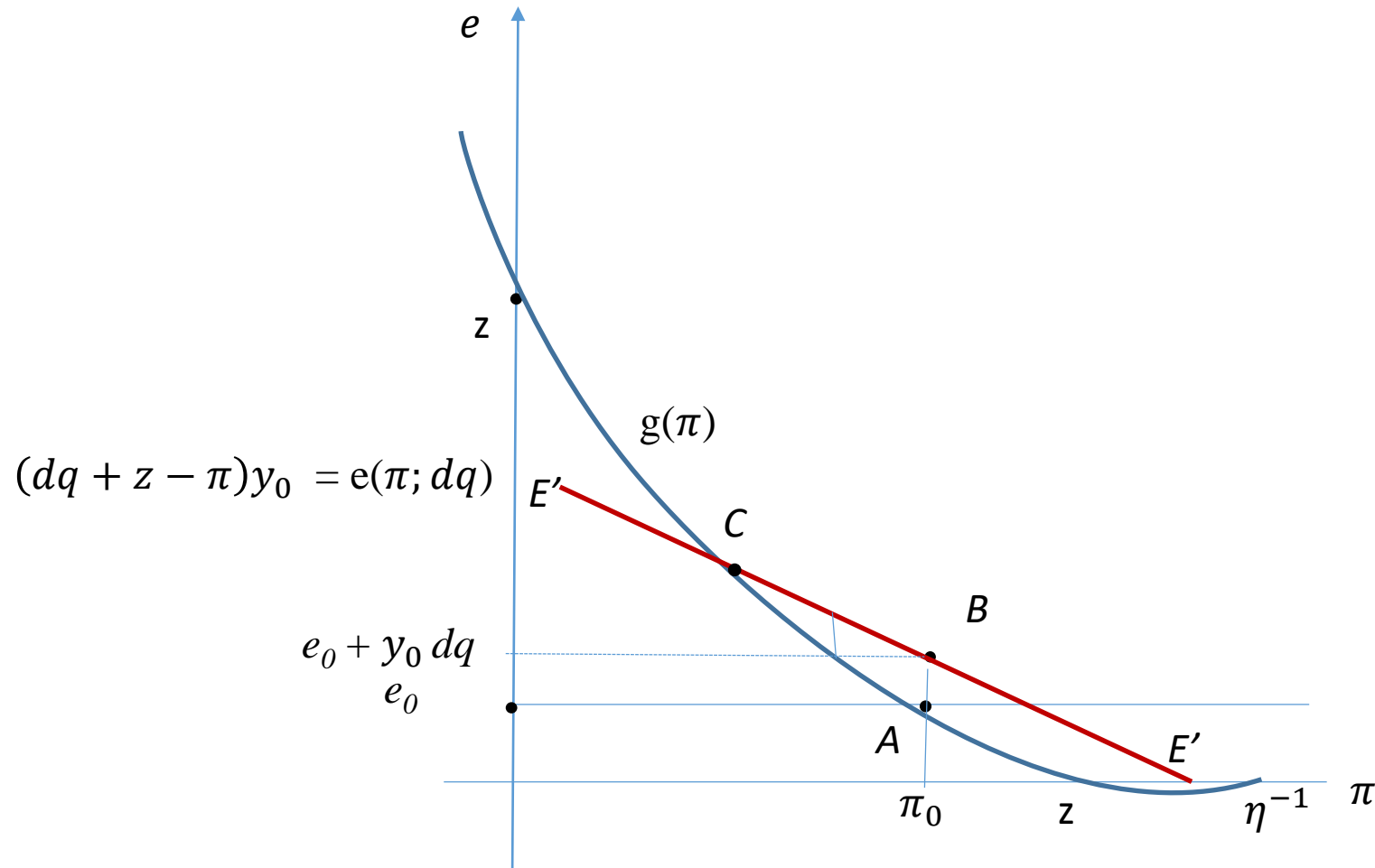
Can plot this graphically as follows:

First, a graph showing how the risk premium falls as demand increases due to higher initial IB equity, e.g.  $\pi_0$  for  $e_0$ , where blue line represents Equation (4)



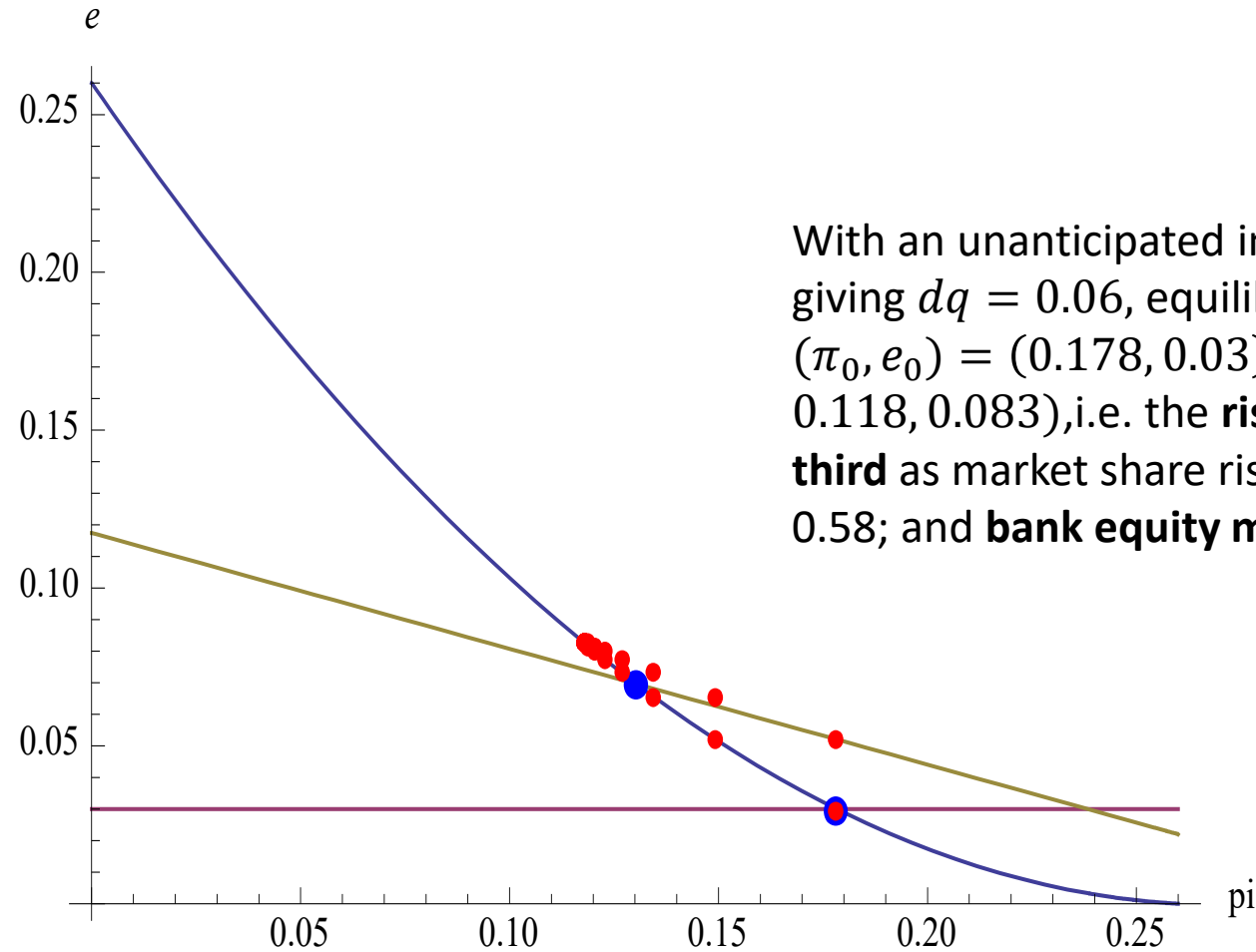
Note however that with 'mark-to-market' accounting, M2M, the market value of initial equity  $e_0$  will move positively with asset prices (and negatively with the risk premium  $q - p$ , as shown by dashed red line).

Then, a Boom as Good News ( $dq > 0$ ) moves the equity constraint upwards, from A to B; so equilibrium shifts from A to C



The effect of 'marking to market' of capital gains is to shift equilibrium from B to C

# Good News: simple calibration of Boom scenario



With an unanticipated increase to  $q' = 1.12$ , giving  $dq = 0.06$ , equilibrium shifts from  $(\pi_0, e_0) = (0.178, 0.03)$  to  $(\pi, e) = (0.118, 0.083)$ , i.e. the **risk premium falls by a third** as market share rises to over a half, 0.58; and **bank equity more than doubles**.

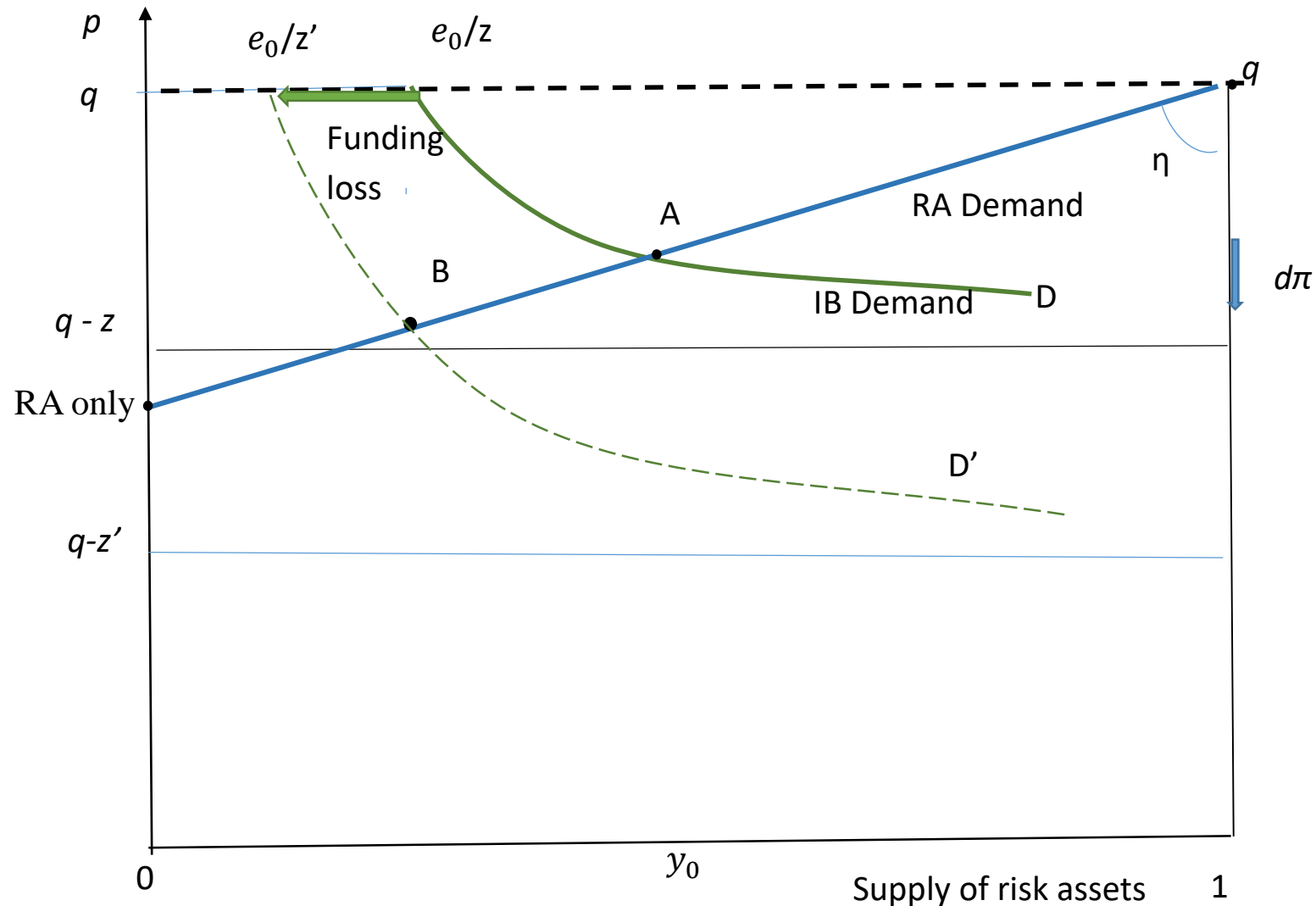
Initial expected return on the risky asset is set at  $q = 1.06$ ; and  $\tau = 0.08$ ,  $z = 0.26$ , so  $\eta = 3.55$ . With initial equity  $e_0 = 0.03$ , the **Initial Equilibrium** ( shown by the red and blue blob) has IBs with market share of  $0.37 = 1 - 3.55 \times 0.18$



## 2. Financial panic; and Fed as Global LOLR in 2008

- At the peak, Wall Street investment banks were **rolling over a quarter of their balance sheets every night.**
- In face of financial panic, given the transatlantic merry-go round, “if the Fed did not act, what threatened was *a transatlantic balance sheet avalanche*, with the Europeans running down their lending in the United States and selling off their dollar portfolios in a dangerous fire sale. It was to hold those dollar portfolios of dollar-denominated assets in place that from the end of 2007 the Fed began to provide dollar liquidity in unprecedented abundance not only to the American but to the entire global financial system, above all to Europe.” (emphasis added)  
Tooze (2018, p.206)

Financial Panic: Shin typically assumes banks are fully 'loaned up', i.e. at VaR limit and have no cash – so what if creditors withdraw funding?



IB Demand is forced to contract from  $D$  to  $D'$ , lowering asset price and increasing the risk premium

Effect of pure Financial Panic –i.e. without quality write-down

Formally a system-wide bank run can be analysed by banks reducing their balance sheets ‘as if’ they aim to hold capital for increased downside risk,  $z' > z$ , and the new equilibrium will be defined by the smaller root of:

$$(9) \quad \eta\pi^2 - (1 + \eta z')\pi + z' = g1(\pi) = e_0 + (\pi_0 - \pi) y_0$$

where  $g1(\pi)$  denotes a modification of  $g(\pi)$  where  $z$  has been replaced by  $z' = (1 - \omega)z + \omega q$  for IBs only, and  $\omega$  denotes the fraction of **wholesale funding withdrawn**.

The RHS indicates the change in the risk premium needed to reach market equilibrium, if it exists - see graph.



## **Bernanke's Nightmare:** Financial Panic associated with Bad News on asset quality

To capture the effect of Bad News ( $dq < 0$ ) together with Financial Panic one looks for a solution subject to the RHS being positive (IBs solvent) in circumstances when there are shifts in both LHS and RHS:

$$(10) \quad \eta\pi^2 - (1 + \eta z')\pi + z' = g1(\pi) = e_0 + (dq + \pi_0 - \pi) y_0$$

where  $e_0$  now refers to equity as valued after the Good News shock.

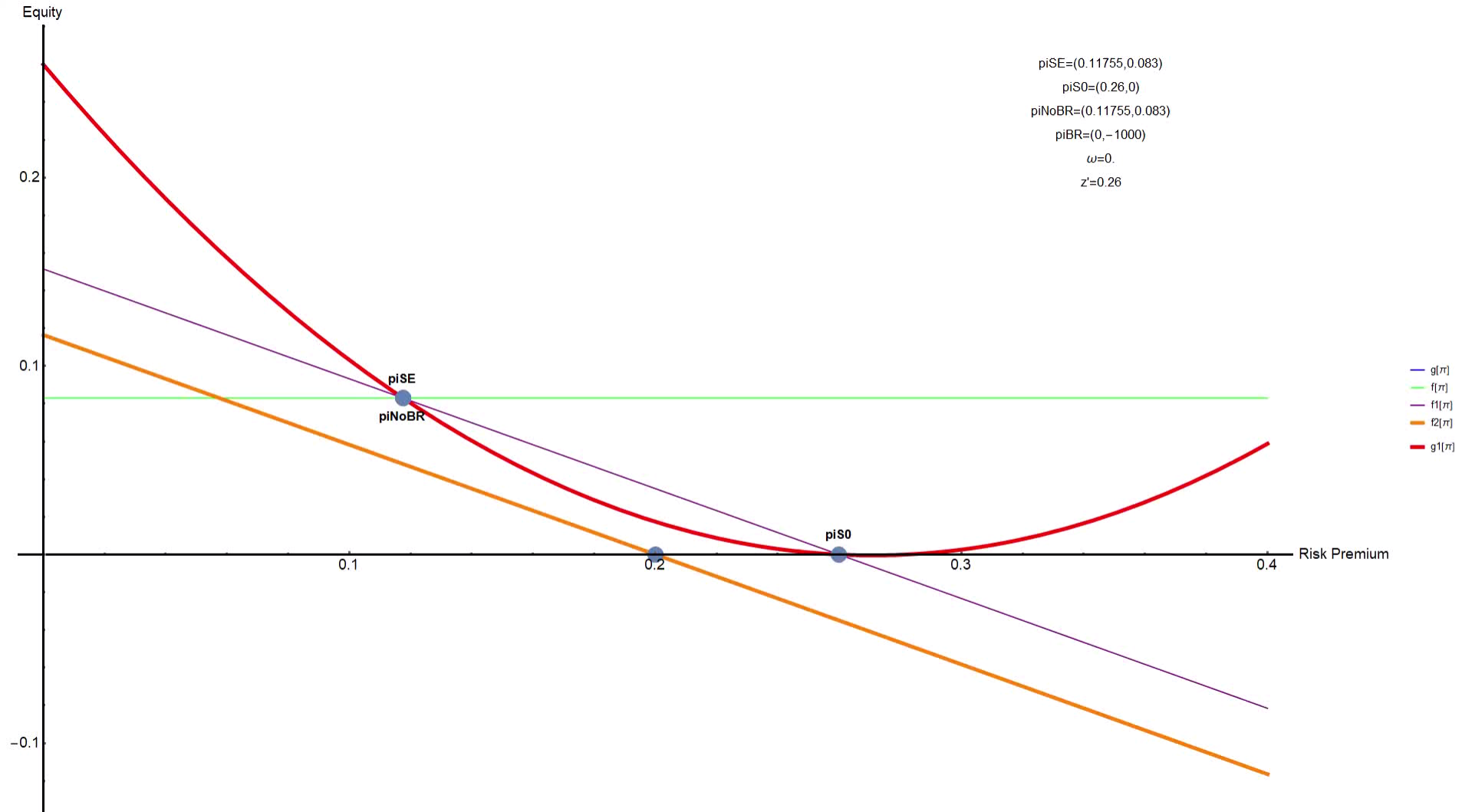
Failing this, the solution – without intervention - would simply be

$$(11) \quad \eta\pi = 1$$

i.e. nonbanks hold all the risky assets as IBs are insolvent.



# What size of run will make IBs insolvent right away? Let's see, using animation supplied by Martin Rohar



## To summarise: Two Fallacies leading to Boom and Bust

### 1. *Regulatory mantra of BCBS:*

‘Micro-prudential rules ensure systemic stability’

But this ignores Pecuniary Externalities (Goodhart,2011)

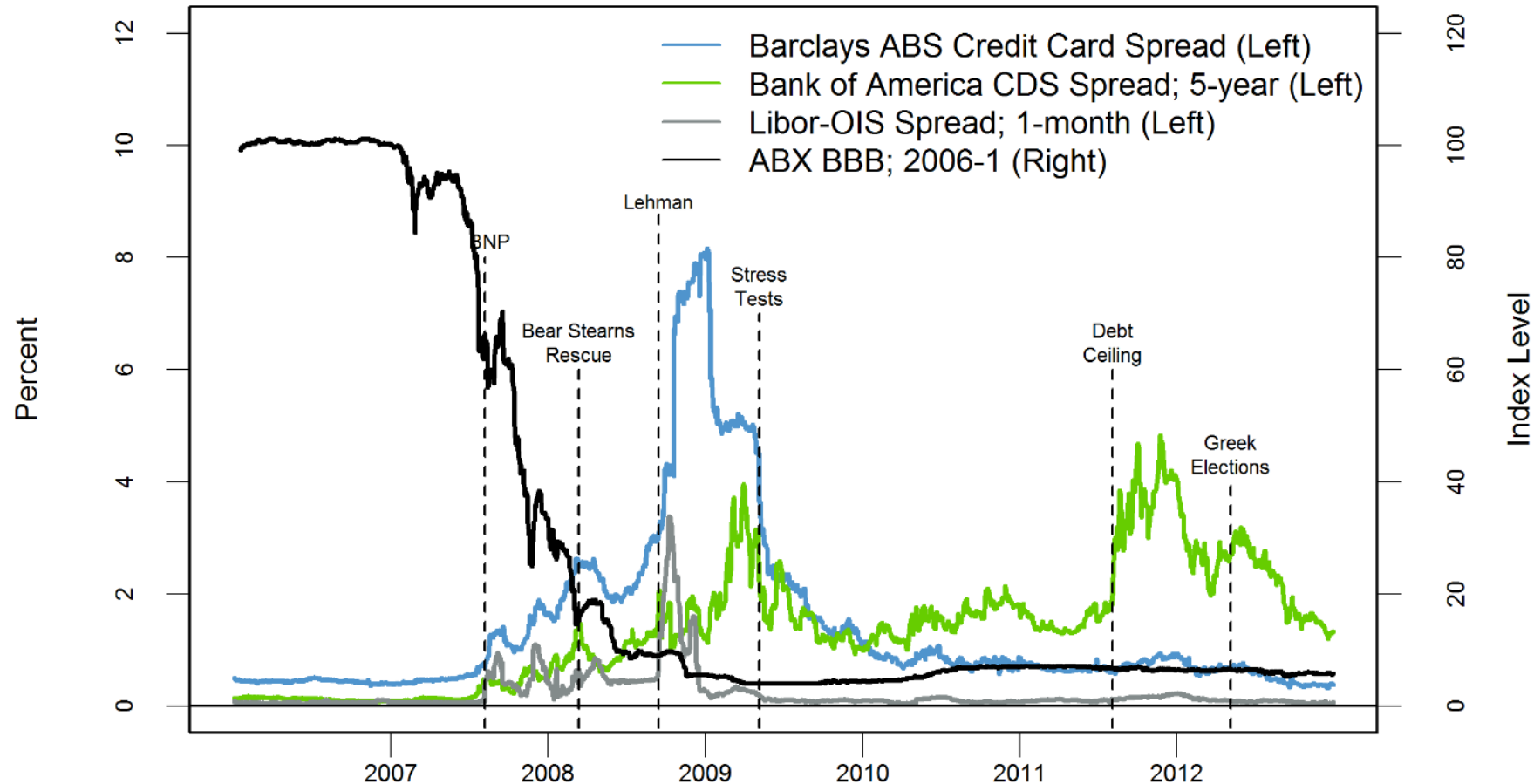
### 2. *Investment Banker’s delusion?*

‘Marketable securities provide liquidity insurance’

But with Bad News and a Failure of Funding, this marketability can - and did - disappear in a systemic bank run



# Collapse in value of MBS, Bernanke (2018b) (note black index for BBB on rh scale)



But hold on: rescue is on its way – for the banks, that is

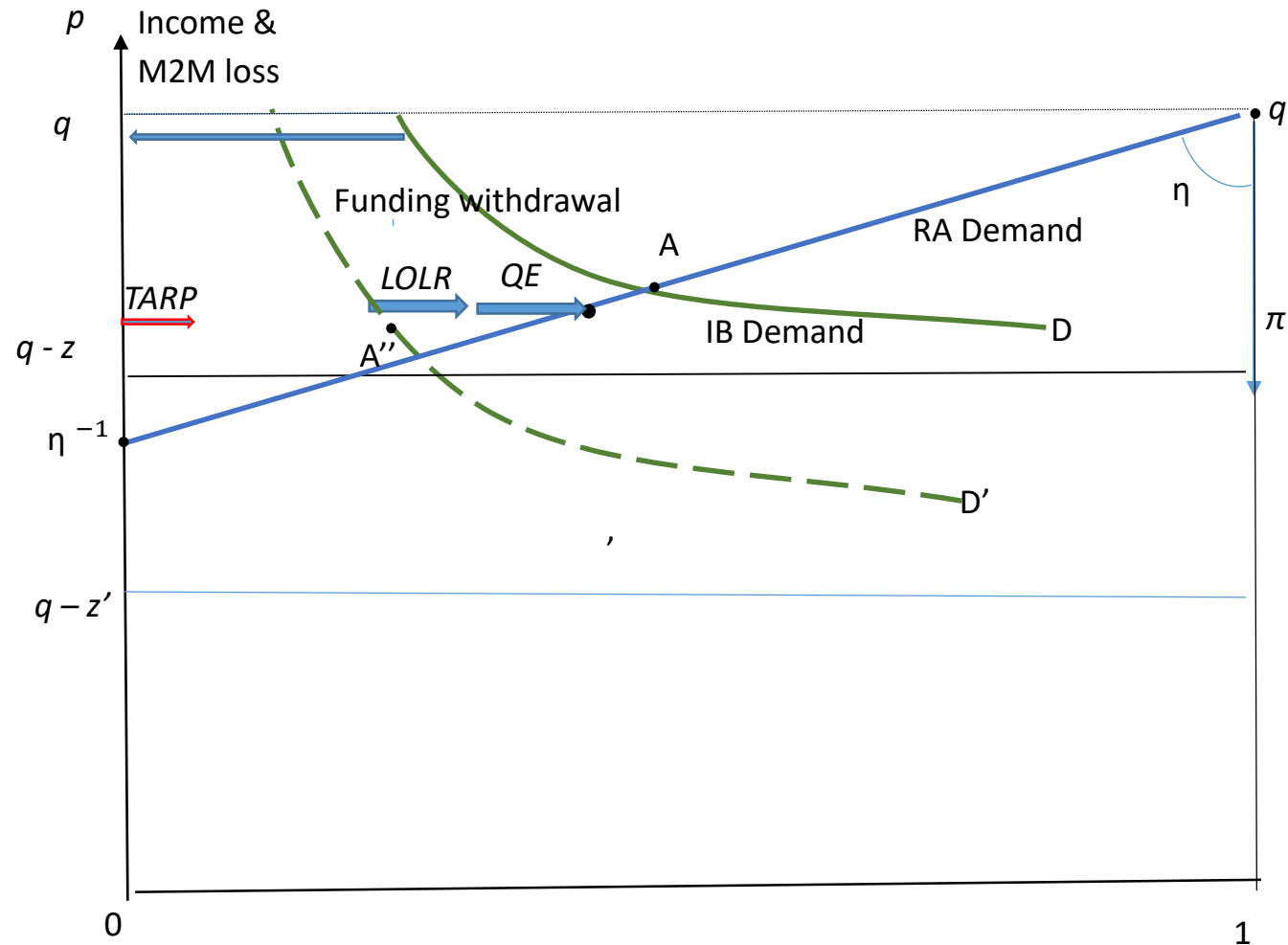


## Memo: 'The Great Escape'\* or how disaster was averted

- The three musketeers raced to the rescue: Bernanke (Fed Chair), Geithner (FRB NY) and Paulson (Treasury)
- Fed as **Lender of Last Resort but on a global scale** cf. Bagehot *Lombard Street*. See details in Tooze (2018, chapter 8) and below.
- Plus Fed took up **MBS in Quantitative Easing**
- Treasury provides TARP backing from US taxpayer, inc. **Capital injections of \$70b  $\approx \frac{1}{2}$  Own Equity of IBs** : 'Main Street saves Wall Street'

\*Del Negro, M., G. Eggertsson, A. Ferrero and N. Kiyotaki (2017) 'The Great Escape? A quantitative evaluation of the Fed's liquidity policies'. *American Economic Review*, 107(3) 824-857. March

Briefly: Funding pullout with income and mark to market losses would have led to insolvency, but for action by Fed (LOLR and QE) and Treasury (Equity Injections)



## Conclusion: what went wrong- and an alternative approach

- Despite VaR rules, bank portfolios were free to act **pro-cyclically** in the boom thanks to pecuniary externalities.
- In the bust, the **multiple equilibrium** perspective of Diamond and Dybvig still proved relevant.
- Not because bank assets are inherently illiquid, as D-D assumed; but because their marketability is prone to aggregate shocks, including ‘liquidity black holes’ when funding is pulled out.
- In *The Future of Capitalism*, Paul Collier (2018) suggests an **annual tax on land values** and a **metropolitan supplement** to higher incomes that would target the gains to ‘agglomeration’ - with the proceeds used to help regenerate provincial cities.
- As an alternative to ‘dynamic credit enhancement’, could some of the tax proceeds not be used to **subsidise housing costs** for those on lower incomes – to help fund social housing, for example?

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# Addendum: Fed as Global LOLR (but don't tell Congress!)

Source Tooze (2018, pp.214, 216)

## Fed Liquidity Facilities and Their Users (in \$ b.)

Facility	Commercial Paper Funding Facility (ABCP/CP) 3 month	Term Auction Facility (TAF)	Single tranche OMOs	Term Securities Lending Facility (TSLF)	Primary Dealer Credit Facility (PDCF) (overnight)
Total lending by facility	737	6,180	910	2,006	8,951
Total large banks	253	3,259	910	2,006	
Large non-American	201	1,799	656	1,017	2,072
% non-American	79%	55%	72%	51%	23%

**Total facilities for large non-US banks (not standardised)**

## Central Bank Liquidity Swap Lines, Dec 2007 to August 2010 (in \$ b.)

Counter party central bank	Raw swap amount	Standardised to 28-day swap
ECB	8,011	2,527
Bank of England	919	311
Swiss National Bank	466	244
Bank of Japan	387	727
Other Central Banks	...	...
Total	10,057	4,450

**Total CB transatlantic swap lines \$3.1 tr standardised**