The Paradox of Risk-Sharing

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Can risk increase due to risk-sharing?

- Financial crisis of 2007-09
  - Variety of markets and contracts aimed at risk-sharing appeared central in bringing about a collapse of the entire financial system
- Example I : <u>Credit Derivatives</u>
- Example II : Securitization
- The paradox of risk-sharing
- An explanation
  - Incentive effects of risk-sharing

Example I : Credit default swaps (CDS)

- CDS are meant to help hedge credit risk
- Credit risk is inherently aggregate or cyclical
- Many CDS contracts sold are on financial firms, CLOs, AAA-tranches of pools of mortgages, etc.
- When contracts had to be honored, protection sellers did not have adequate liquidity
- A.I.G. Financial Products is a leading example

A.I.G. FP's liquidity needs

	2007-1	2007-2	2007-3	2007-4
Marginal Call Reports				
Additional Collateral for One-notch Downgrade Rating [4]	$902	$847	$830	$1,390
Additional Collateral for Two-notch Downgrade Rating				
Additional Collateral for Three-notch Downgrade Rating				
Additional Collateral for Multi-notch Downgrade Rating				
	2008-1	**2008-2**	**2008-3**	**Actual**
Marginal Call Reports				
Additional Collateral for One-notch Downgrade Rating [4]	$1,800	$1,200	$1,800	
Additional Collateral for Two-notch Downgrade Rating			$9,800	Moody's/Fit
Additional Collateral for Three-notch Downgrade Rating			$20,000	S&P
Additional Collateral for Multi-notch Downgrade Rating			$32,000	Market risk

- A.I.G. (Q3 2008):

Two-notch downgrade = $9.8bln; Three-notch = $20bln (est), $32bln (realized)

Cash = $2.5bln in March 2008

($18.6bln post-intervention Sep 08, due to $61bln Fed borrowings)

Margin-risk coverage ratio < 1 for two-notch downgrade

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Example II : Securitized assets

- Pool and diversify risks
- If risks are idiosyncratic, incur average losses
- If risks are partly systematic, then unexpected losses can be larger than average losses
- Yet, those who held large portions of such securitized assets (MBS, ABS) held little in terms of reserves to manage systematic risk
- Explains a large part of the financial crisis

Pooling of risks and loss outcomes

Loan Loss Distribution with $p = 1.5\%$, $\rho = 12\%$ and 0.6%
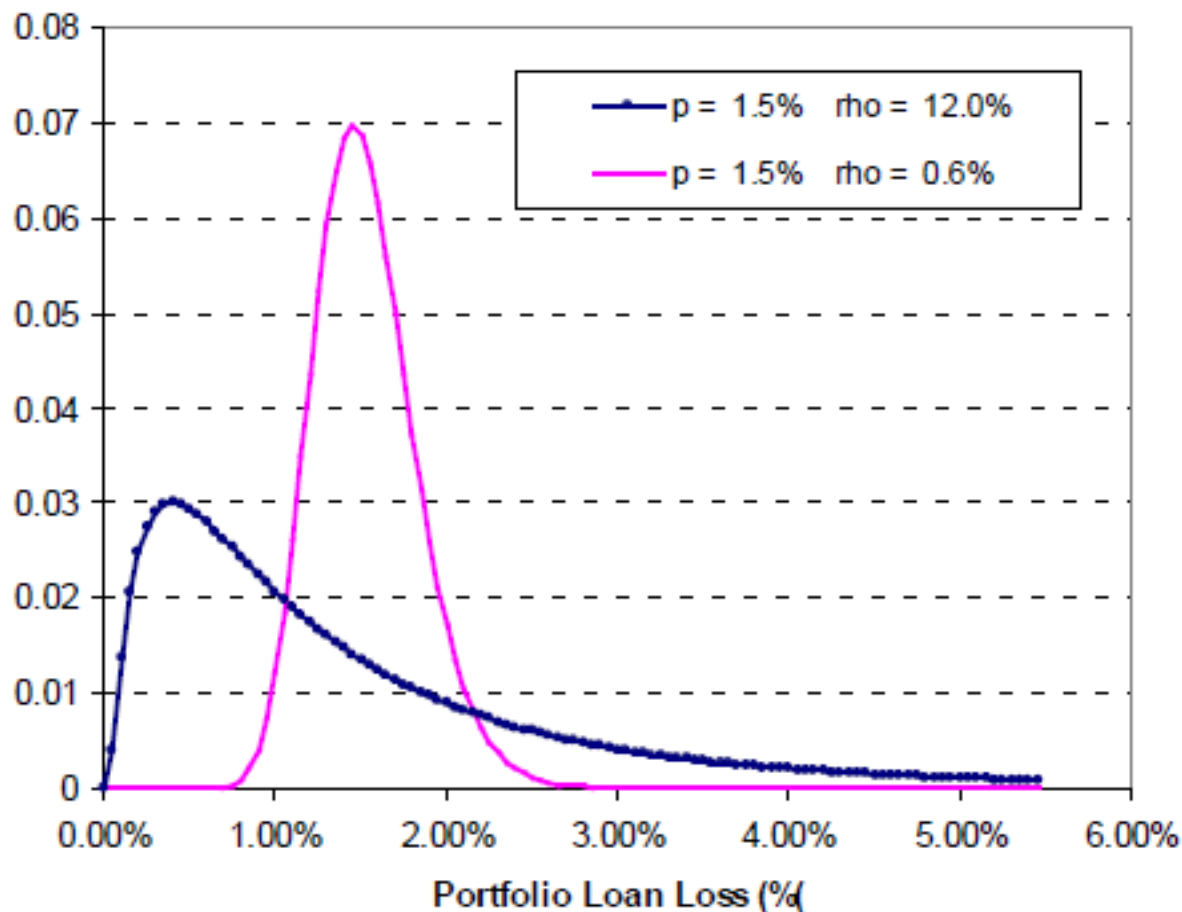
# Holdings of US Residential Real Estate Exposure (Lehman Brothers, June '08)

	Loans	HELOC	Agency MBS	Non-Agency AAA	CDO Subord	Non CDO Subord	Total	
Banks & Thrifts	2,020	869	852	383	90		4,212	39%
GSEs & FHLB	444		741	308			1,493	14%
Brokers/dealers			49	100	130	24	303	3%
Financial Guarantors		62			100		162	2%
Insurance Companies			856	125	65	24	1,070	10%
Overseas			689	413	45	24	1,172	11%
Other	461	185	1,175	307	46	49	2,268	21%
Total	2,925	1,116	4,362	1,636	476	121	10,680	
	27%	10%	41%	15%	4%	1%		

The Paradox of Risk-Sharing

- Why does there appear to be greater aggregate risk when there are financial innovations to share risks amongst agents?

- Why have bank capital and liquidity in the financial sector declined steadily over time?

- Rajan (2005) *"Has Financial Development Made the World Riskier?"*

- Acharya, Cooley, Richardson and Walter (2010) *"Manufacturing Tail Risk"*

History of Banking Capital Ratios in US and UK
(Alessandri and Haldane, 2009)
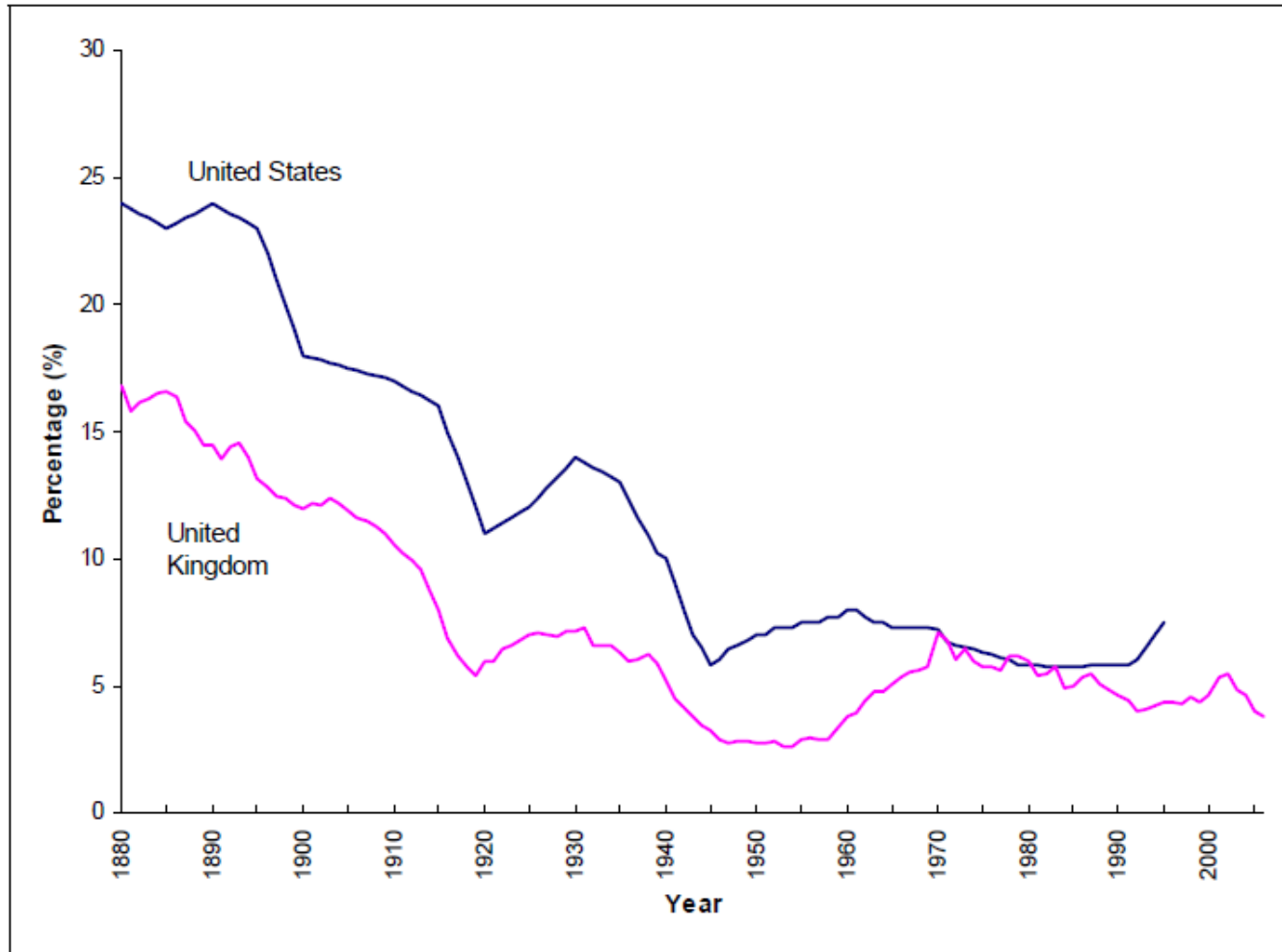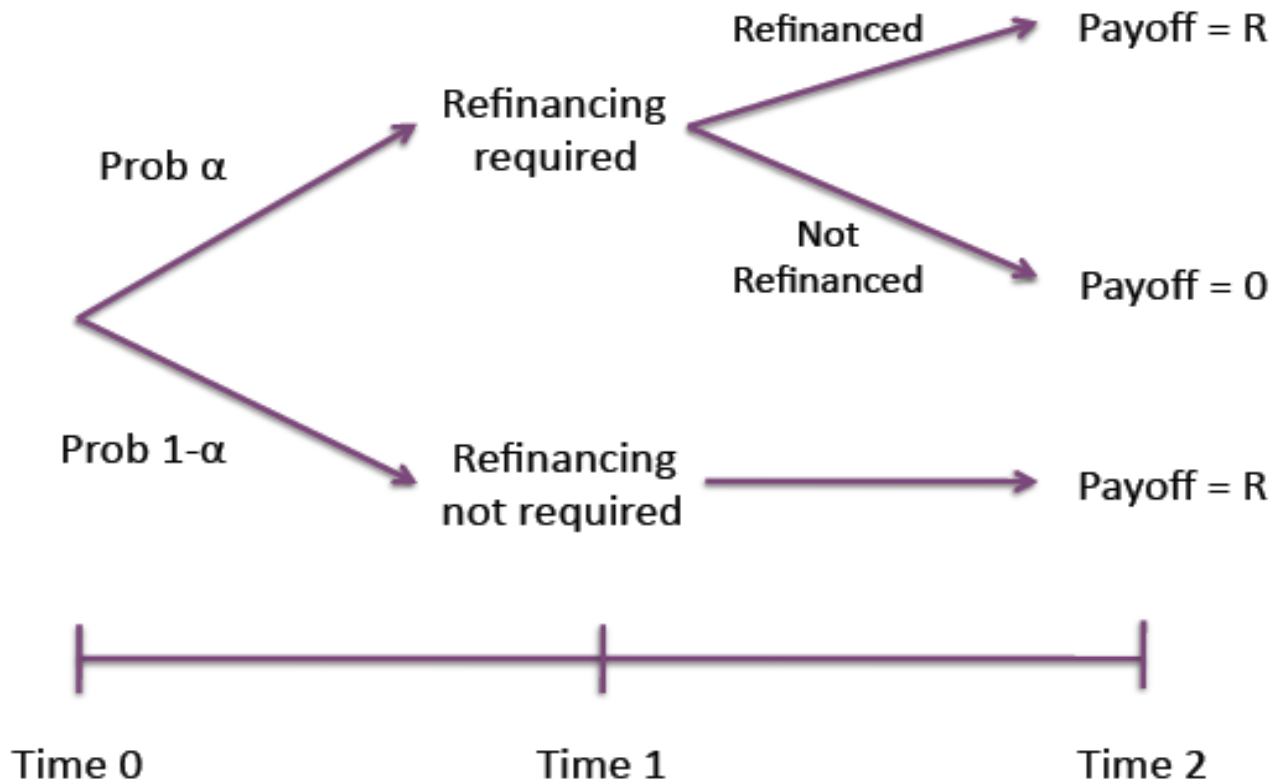
An Explanation

- Autarky
  - No possibility to share risks
  - Shocks to investments must be met by firms through individual cash holdings
  - If firms find it desirable to hedge the shocks, the liquidity held hedges aggregate risk too
  - Overall outcome
    - <u>Greater liquidity/reserves, lower investments</u>
    - Low incidence of idiosyncratic defaults
    - <u>Low incidence of aggregate "crises"</u>
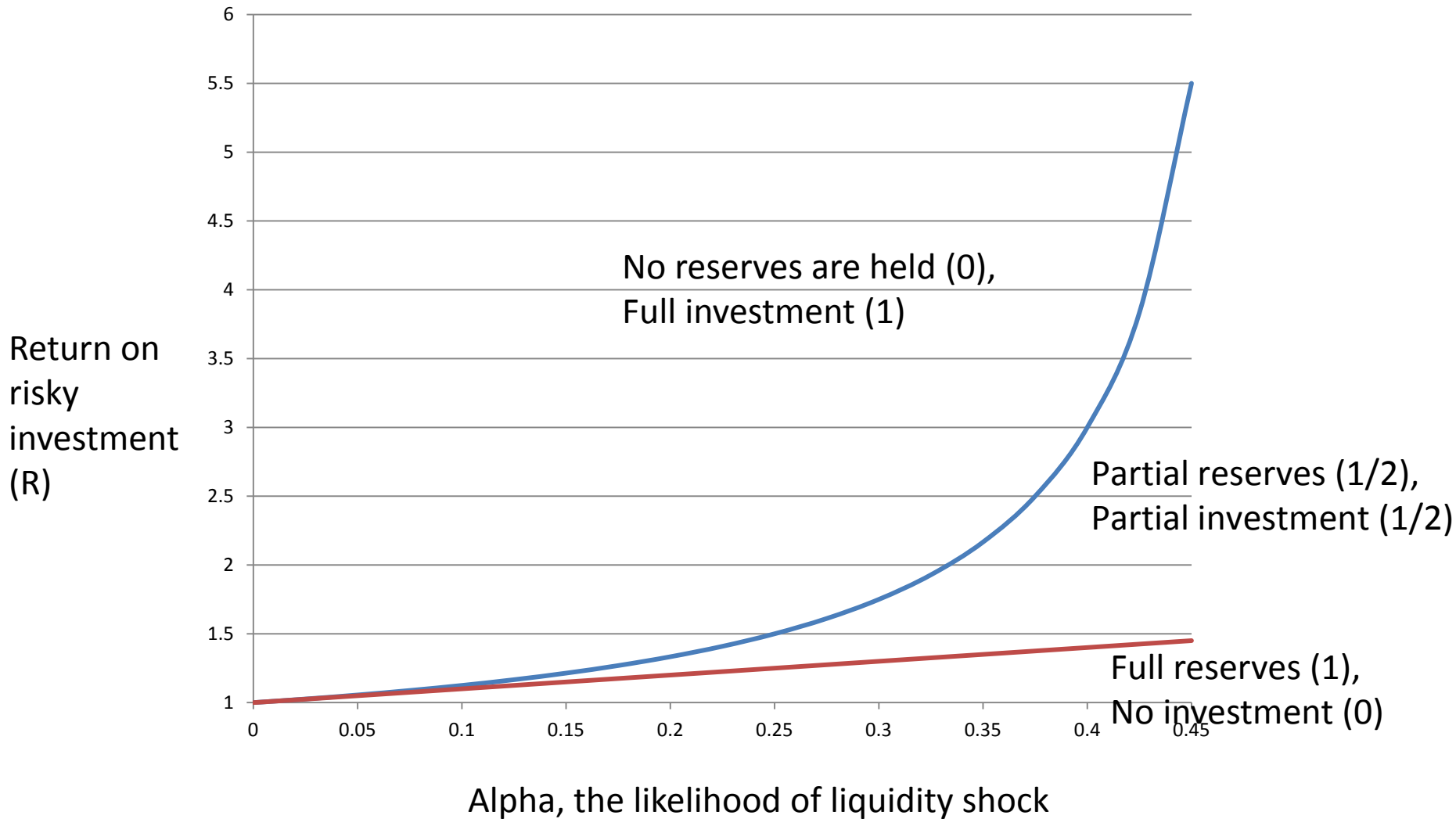
Explanation (continued)

- Risk-sharing via financial innovations
  - Idiosyncratic shocks can be managed better through inter-firm transfers of liquidity
  - Each firm requires to hold less liquidity as they can "free ride" on liquidity in the system
  - Holding liquidity to deal with low-likelihood aggregate shocks ("tail risks") becomes prohibitively expensive
  - Overall outcome
    - Smaller liquidity/reserves, greater investments
    - Low incidence of idiosyncratic defaults
    - Greater incidence of aggregate "crises"

A Simple Model

Figure 1: The Risky Investment Opportunity

Autarky

Return on risky investment (R)

6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1

No reserves are held (0),
Full investment (1)

Partial reserves (1/2),
Partial investment (1/2)

Full reserves (1),
No investment (0)

0   0.05   0.1   0.15   0.2   0.25   0.3   0.35   0.4   0.45

Alpha, the likelihood of liquidity shock

Risk-sharing (assume independence)

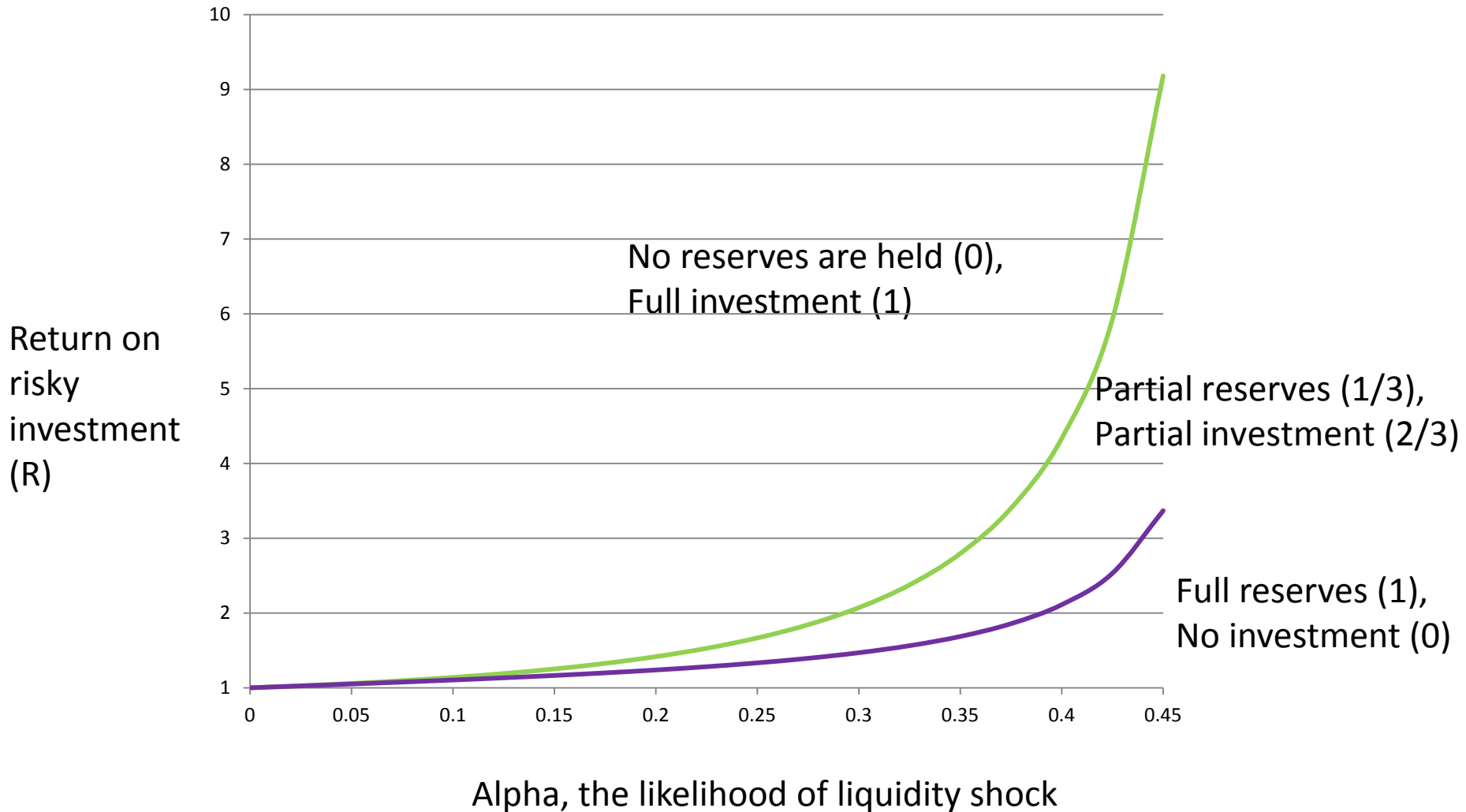| State	Probability	Risky Projects Outcome
1	p_1	Neither project requires refinancing
2	p_2	Only Bank 2 needs refinancing
3	p_3	Only Bank 1 needs refinancing
4	p_4	Both banks need refinancing

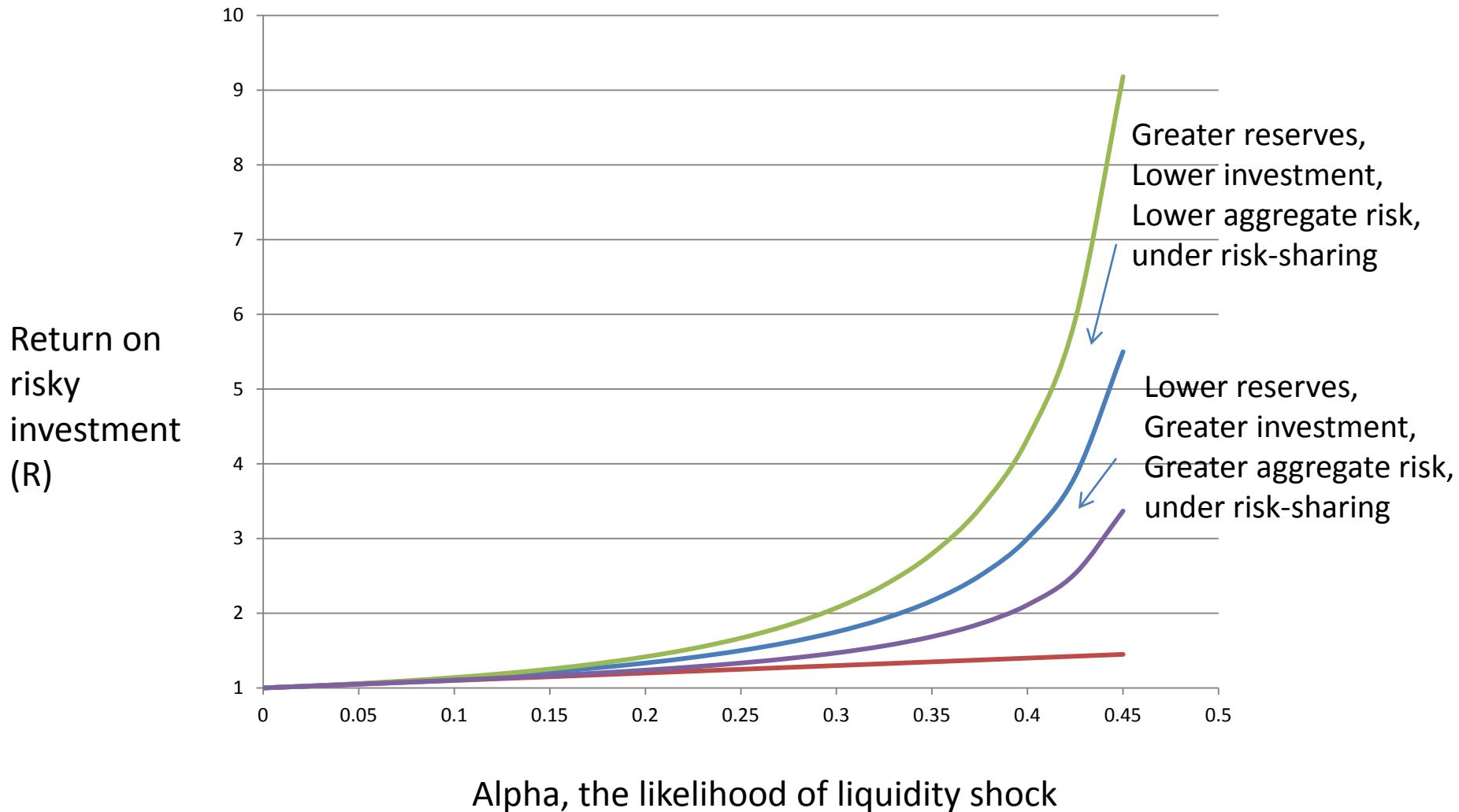$$p_1 = (1-\alpha)^2$$

$$p_2 = \alpha(1-\alpha)$$

$$p_3 = \alpha(1-\alpha)$$

$$p_4 = \alpha^2$$

Risk-sharing outcomes

Return on risky investment (R)

No reserves are held (0),
Full investment (1)

Partial reserves (1/3),
Partial investment (2/3)

Full reserves (1),
No investment (0)

Alpha, the likelihood of liquidity shock

Risk-sharing leads to un-hedged aggregate risk

Return on risky investment (R)

Greater reserves,
Lower investment,
Lower aggregate risk,
under risk-sharing

Lower reserves,
Greater investment,
Greater aggregate risk,
under risk-sharing

Alpha, the likelihood of liquidity shock

An analogy from economics

- Do seat belts in cars reduce or increase the incidence of car accidents and deaths?
- Direct effect
  - All else equal, reduce accidents
- Incentive (or insurance) effect:
  - Drivers drive faster once there are seat belts
  - This tends to increase accidents
- Overall welfare effect: Ambiguous
- The insurance effect of financial innovations is not sufficiently appreciated

Welfare effects of risk-sharing

- If aggregate defaults lead to significant externalities or spillovers that are costly
  - Reinhart and Rogoff (2008) *"This Time is Different"*
  - Banks to households
  - Banks to the real economy
  - Banks to governments
- Then, there can be a case for reserve or capital requirements against aggregate risks
  - More relevant when there is risk-sharing
  - Else, firms will hedge the risk themselves