ECON 4335 The economics of banking

Lecture 8, 13/3-2013: Capital Regulation, Contagion, Liquidity Regulation

Bent Vale,
Norges Bank*

*Views and conclusions are those of the lecturer and can not be attributed to Norges Bank

Topics of this lecture:

- Capital Regulation: Basel I to Basel III, capital requirements and banks' funding costs
- Contagion of liquidity shocks (A&G Ch. 10)
- Liquidity regulation

CAPITAL REGULATION

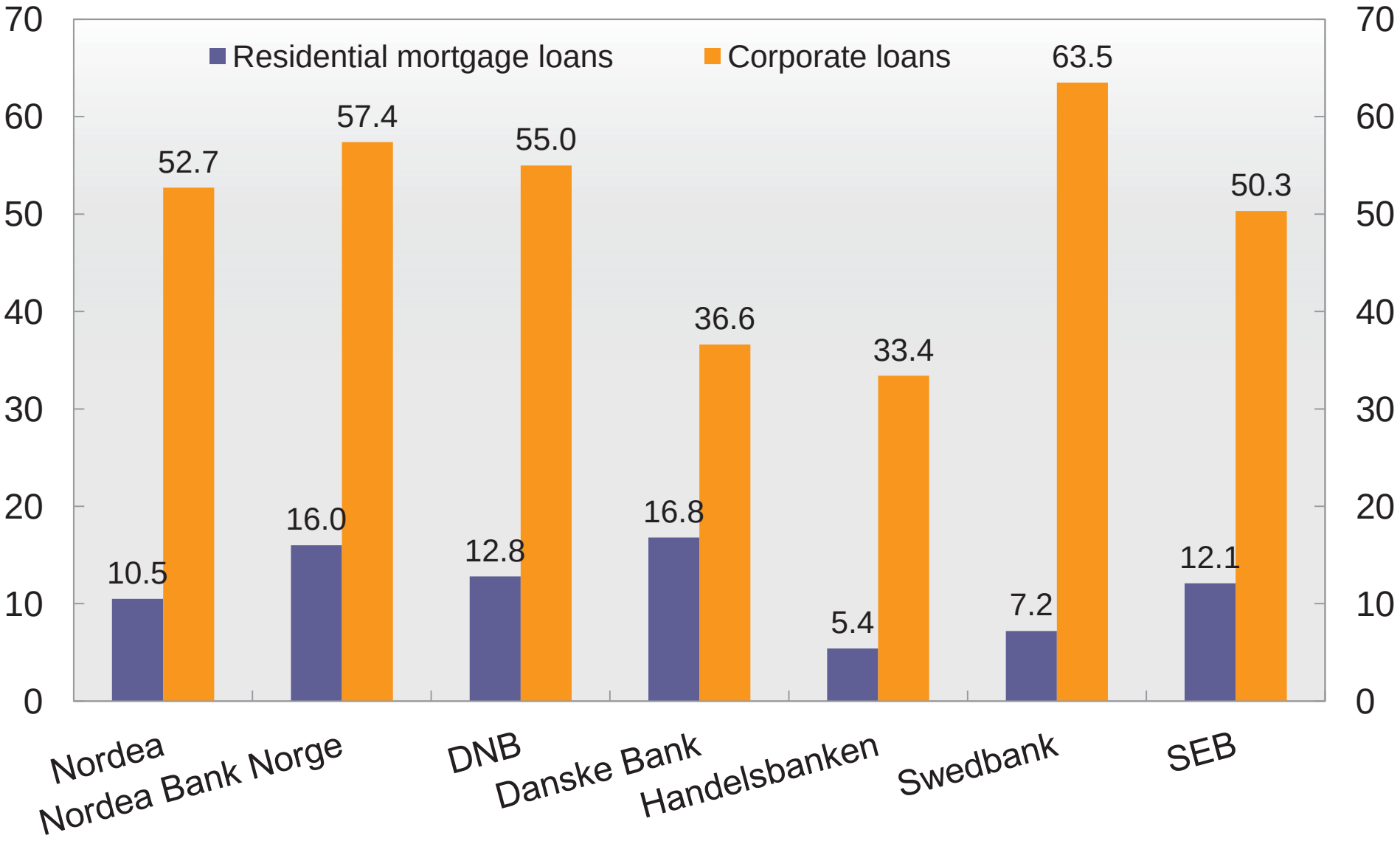
Capital regulation

- Regulate how much equity a bank must have relative to total liabilities
  - Norway 6.5 pct. from 1972, with lenient definitions
- In 1988 the first Basel Accord (Basel I): capital requirement relative to *risk weighted assets (RWA)*
  - 8 pct. capital of RWA (min. 4 pct. common equity (tier 1), rest subordinated debt (tier 2))
  - Standard weights for all banks: 50 pct. for residential mortgages, 100 pct. for business loans, 20 pct. for loans to other banks, 0 pct. for loans to OECD governments.

Basel II in 2006: More granular risk weights, more lenient definition of capital.

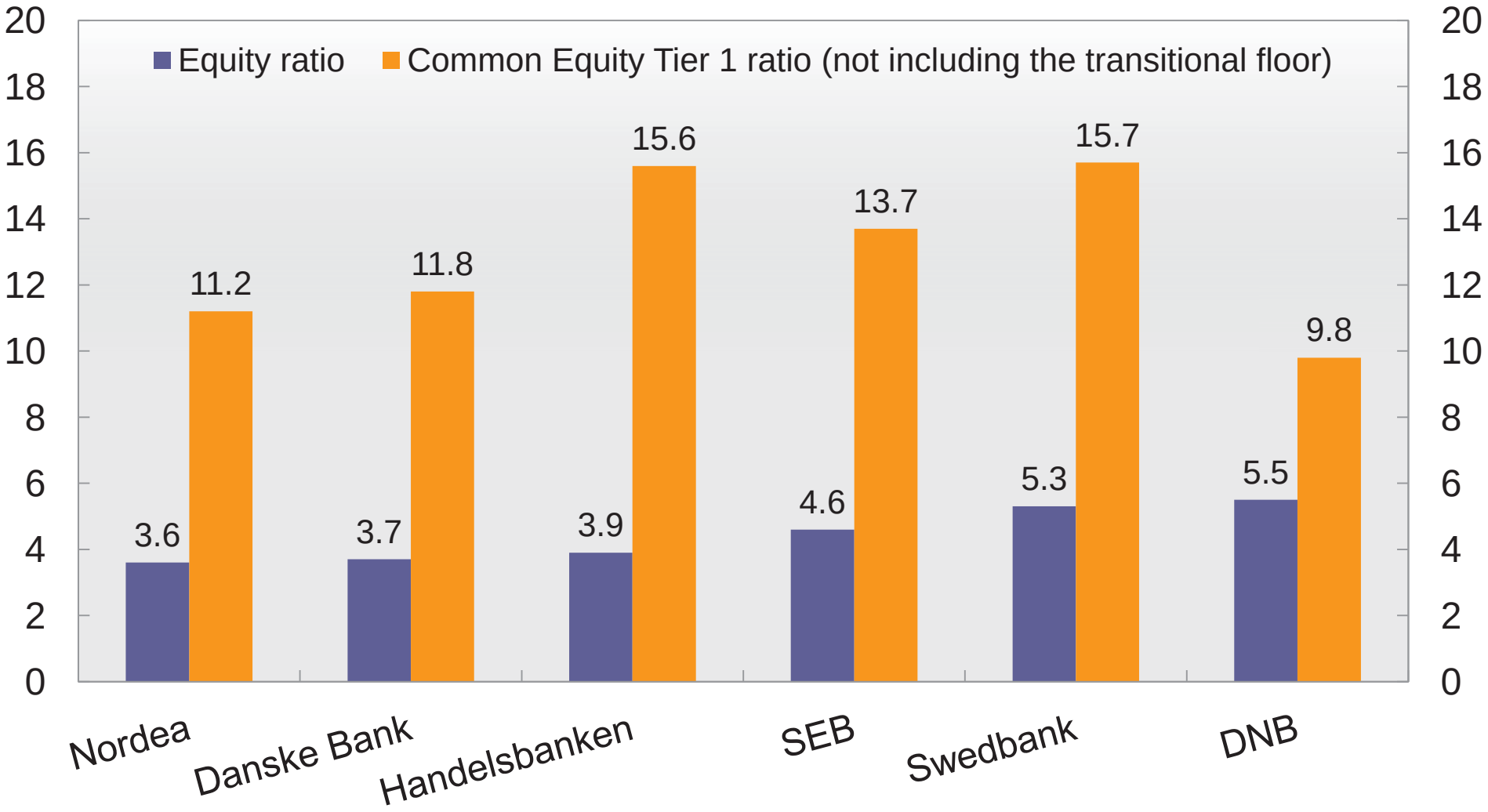
- Standard approach to risk weights:
  - Loans to governments, other banks and businesses based on credit rating of the borrower (0 to 150 pct.). Non-rated borrowers 100 pct.
  - Residential mortgages 35 pct.
- Banks can choose to use their own models to estimate risk weights, *Internal Risk Based (IRB)*.
  - Some examples: see chart

Chart 2 Average risk weights for residential mortgage loans and corporate loans (IRB models) for the six largest financial groups in the Nordic region and the subsidiary Nordea Bank Norge. Percent. As at 31 December 2011



Source: Pillar 3 reports from the institutions

Chart 1 Equity ratio[1)] and Common Equity Tier 1 ratio[2)] not including the transitional floor for the six largest financial groups in the Nordic region. Percent. As at 31 December 2011



1) Equity ratio = Equity / Total assets
2) Tier 1 capital excluding hybrid instruments / Sum risk-weighted assets
Source: Public financial information from the institutions

Basel II:

- More lenient definition of capital
  - Tier 1 still 4 pct. of RWA
  - But equity or CET1 only 2 pct. of RWA, allows 2 pct. as hybrid capital.
  - Tier 2 as in Basel I.

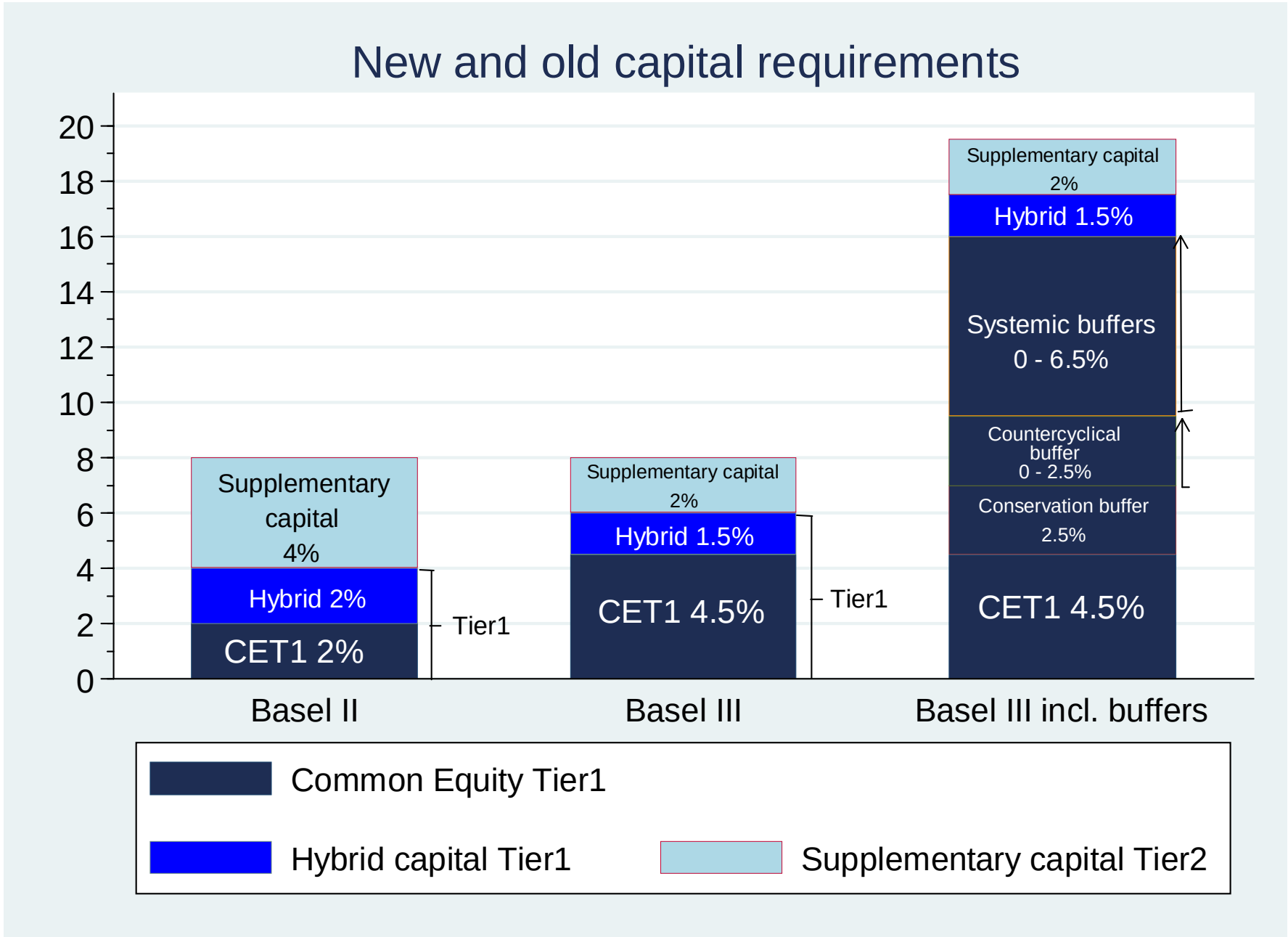
But during the financial crisis these capital ratios proved inadequate.

Enter Basel III

Recommended in 2010, to be phased in gradually from 2013 to 2015.

- Much stricter definition of capital. More capital with loss absorbency, i.e., more CET1. Introduction of extra capital buffers consisting of CET1.

- Leverage ratio requirement, CET1 relative to *unweighted assets* at 3 pct. from 2018.
  A backstop if estimation of RWA becomes too optimistic.


New and old capital requirements
20
18
16
14
12
10
8
6
4
2
0
Supplementary capital 4%
Hybrid 2%
CET1 2%
Tier1
Supplementary capital 2%
Hybrid 1.5%
CET1 4.5%
Tier1
Supplementary capital 2%
Hybrid 1.5%
Systemic buffers 0 - 6.5%
Countercyclical buffer 0 - 2.5%
Conservation buffer 2.5%
CET1 4.5%
Basel II
Basel III
Basel III incl. buffers
Common Equity Tier1
Hybrid capital Tier1
Supplementary capital Tier2

Banks' funding costs and their equity ratio

- Define:
  - $\alpha =$ bank's equity over total assets (equity ratio)
  - $r_T =$ bank's total funding costs
  - $r_E =$ required return on bank's equity
  - $r_D =$ interest on bank's debt (deposits and other debt)
- Then $r_T = \alpha r_E + (1 - \alpha) r_D$

Banks' funding costs and their equity ratio

Higher equity ratio

$$dr_T = (r_E - r_D)d\alpha + \alpha\frac{\partial r_E}{\partial \alpha}d\alpha + (1-\alpha)\frac{\partial r_D}{\partial \alpha}d\alpha$$

According to Modigliani-Miller theorem $\frac{dr_T}{d\alpha} = 0$.

But deviations from MM relevant for banks:

- Implicit and explicit debt guarantee.
- Favorable tax treatment of debt relative to equity (not that important in Norway).

Higher equity ratio and bank's funding costs

- Let $\alpha = 0.06$, $r_D = 2.25\%$, $r_E = 16\%$, $\frac{\partial r_D}{\partial \alpha} = 0$ (implicit and explicit guarantee).

- Let $\frac{\partial r_E}{\partial \alpha} = -59.8$ (effect of lower volatility on equity value, cf. Vale (2011))

- Let $d\alpha = 0.015$, then:

$$
\begin{aligned}
dr_T &= (16 - 2.25) \cdot 0.015 - 59.8 \cdot 0.06 \cdot 0.015 = 0.1524 \\
dr_T &= (16 - 2.25) \cdot 0.015 = 0.20625 \text{ if } \frac{\partial r_E}{\partial \alpha} = 0
\end{aligned}
$$

CONTAGION OF LIQUIDITY SHOCK

Contagion of liquidity shock (A&G Ch. 10)

- Show how interbank markets between banks in different regions can smooth differences in liquidity demand between regions.
- However, an unexpected shock in liquidity demand in on region can spread to other regions through the interbank market.
- Can even cause a run to spread to all regions, a fully fledged financial crisis.
- Banks confer negative externalities on each other.
- Argument for regulation and liquidity requirement.

Model setup ("Allen & Gale" liquidity model)

- Three periods $t = 0, 1, 2$.

- Consumers in each of 4 identical regions A, B, C and D.Have one unit of good each at $t = 0$. At $t = 1$ consumers learn wether they are early consumers $u = u(c_1)$ a fraction λ, or late consumers $u = u(c_2)$ a fraction $(1 - \lambda)$. Type of consumer is private information.

- Banks in each region offer consumers to deposit 1 in $t = 0$ and withdraw c_1 in $t = 1$, and c_2 in $t = 2$.

- At $t = 0$, banks invest deposits:
  - y in short liquid asset which yields 1 after one period. Consumers have access to same technology.
  - x in long asset yielding $R > 1$ in $t = 2$, but can be liquidated at value $r < 1$ in $t = 1$.
  - z as deposit in neighboring bank, A in B, B in C, C in D, and D in A.

- Two states of the economy S_1 and S_2 happen with equal probability 0.5.

	A	B	C	D
S_1	λ_H	λ_L	λ_H	λ_L
S_2	λ_L	λ_H	λ_L	λ_H

where $\lambda_H > \lambda_L$

Decentralized solution is first best.

- $1 = c_1 \leq c_2$, late consumers find it optimal to withdraw at $t = 2$ instead of $t = 1$

- Banks invest x, y, and z taking the states and their probability into account.

- If state S_1: A-banks withdraw from B-banks that have liquidity surplus, C-banks withdraw from D-banks that have liquidity surplus.

- If state S_2: B-banks withdraw from C-banks that have liquidity surplus, D-banks withdraw from A-banks that have liquidity surplus.

An unexpected state $\overline{S}$, i.e., a state which at $t = 0$ is considered to have zero probability.

	A	B	C	D
S_1	λ_H	λ_L	λ_H	λ_L
S_2	λ_L	λ_H	λ_L	λ_H
$\overline{S}$	$\overline{\lambda} + \varepsilon$	$\overline{\lambda}$	$\overline{\lambda}$	$\overline{\lambda}$

- Aggregate excess demand for liquidity at $t = 1$. But ε very small.

- A-banks withdraw deposits from B-banks who withdraw from C-banks and so on, finally D-banks withdraw from A-banks. A-banks must liquidate some long assets and c_2 in A is reduced, lower than promised, but no run. No contagion.

Some spill-over, ε is larger

- A-banks must immediately liquidate some of its long assets, so much that $c_2 < 1$.
- Hence run from all depositors, including D-banks, on A-banks at $t = 1$.
- D-banks take some loss, implies they have to liquidate some of their long assets, but still $c_2 > 1$, even if lower than promised.
- Hence, a shock in A has spilled over to D and caused some losses there.

Contagion to all banks if in addition to larger ε, R is sufficiently small even if it is > 1.

- A-banks must immediately liquidate some of its long assets, so much that $c_2 < 1$.
- Hence run from all depositors, including D-banks, on A-banks at $t = 1$.
- But now, due to low R, there is so little value of D-banks' remaining long asset in $t = 2$ that $c_2 < 1$. Hence run on D-banks also from C-banks.
- Same happens with C-banks and B-banks.

- A shock in A has caused contagion to all other regions, and run on all banks. Shock in one region causes a full global banking crisis.

- These results have been proved to be robust to the number of regions (and partly to other topologies).

- When banks withdraw their deposits in other banks they can confer a negative externality on other banks, forcing them to liquidate assets prematurely.

- An argument for requiring banks to invest more in the liquid asset y than they each find optimal in the decentralized solution.

- Reduces the probability that a shock in one region causes contagion or spillovers.

- But a cost: c_2 is reduced. Hard to know how high such a liquidity requirement should be in practice. Thus it can easily be set too high.

Liquidity regulation

In Basel III: Liquidity Coverage Ratio

- A bank must have enough liquid assets that it can sustain, without borrowing, an expected net outflow for 30 days.

- Interbank deposits or other claims on other banks *not* defined as liquid assets under this regulation.