AXA LSE Research Programme

- To examine reward and governance structures of complex, systemically important financial institutions.
- To research the workings of complex interconnected financial institutions in financial networks: information, incentives, capital and liquidity.
- Development of risk models that incorporate bank specific and macro factors.
- To examine and suggest improvements to the design of regulation with a focus on forward looking countercyclical measures.

Background

- A notable feature of the financial crisis has been that it has raised questions about the workings of the invisible hand (the coordinating role of market clearing prices) and concerns about regulatory failure:

  Northern Rock-funding gridlock;

  Mispricing of risk: pricing of credit risk, credit default swaps, CLO's and CDOs;

  Lehmans, AIG and the aftermath.

- Banking is complex-there are many interconnections and externalities.

“Any asset portfolio is, in essence, a financial network. So the balance sheet of a large financial institution is a network, with nodes defined by the assets and links defined by the correlations among those assets. The financial system is similarly a network,with nodes defined by the financial institutions and links defined by the financial interconnections between these institutions.

Evaluating risk within these networks is a complex science; …….When assessing nodal risk, it is not enough to know your counterparty; you need to know your counterparty’s counterparty too. In other words, there are network externalities. In financial networks, these externalities are often referred to as contagion or spillovers. There have been many examples of such spill-over during this crisis, with Lehman Brothers’ failure a particularly painful one.

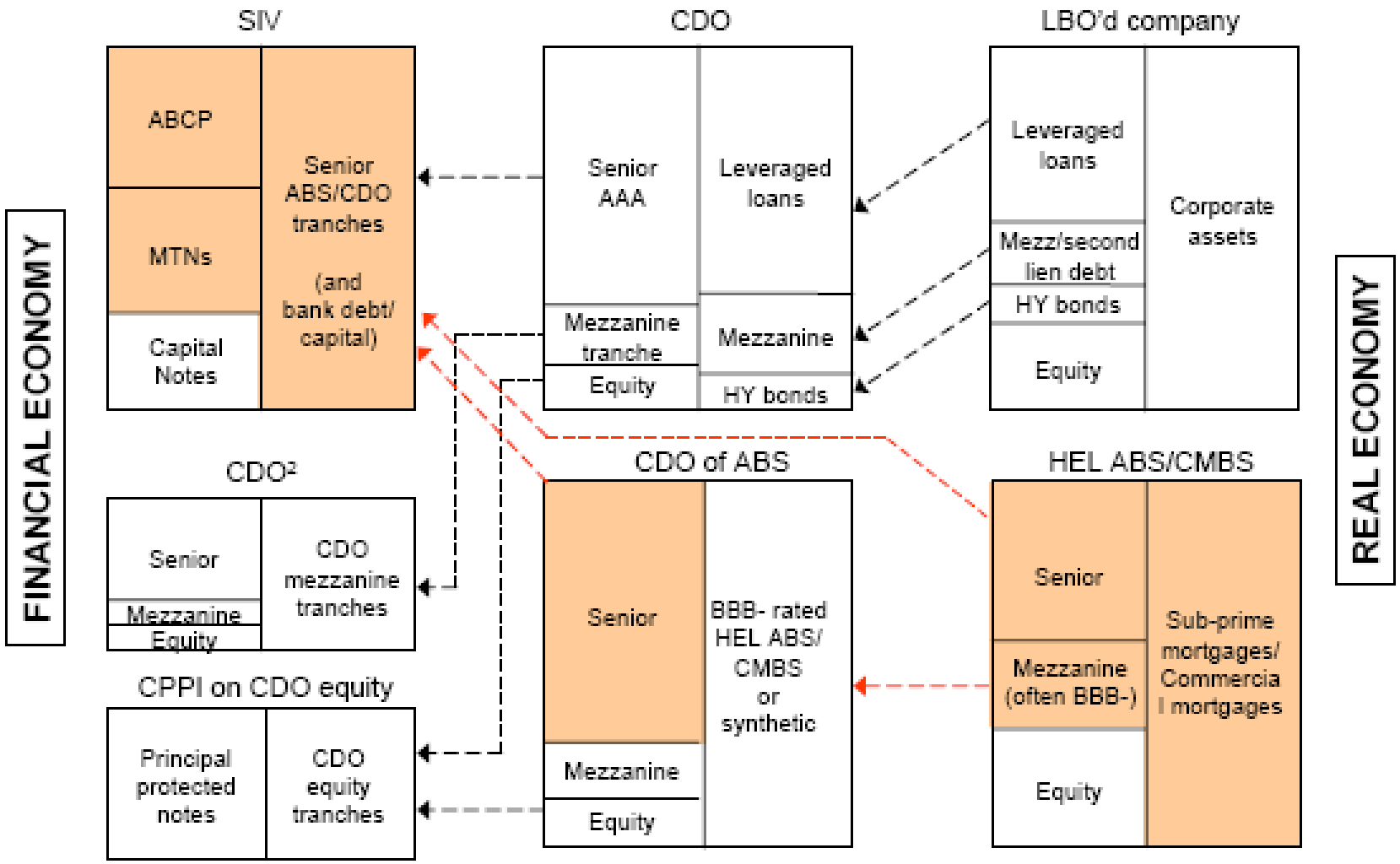
That is why there have been recent calls to calibrate regulatory requirements to these risk externalities.”

These network uncertainties make it tremendously difficult for risk managers to identify and price, and hence manage, balance sheet risk. Consider first evaluating risks across the portfolio of an individual firm. There is evidence that firms find aggregation of risks across their balance sheet extremely difficult to execute. To the extent this is done at all, it requires firms to make assumptions about correlations between asset prices. But at times of stress, asset correlation matrices are unlikely to be stable and correlations invariably head towards one. So pre-crisis measures of balance sheet risk are likely to be significant under-estimates……..

These risk externalities will tend to be amplified when aggregated across the network as a whole.

Andrew G Haldane February 2009

Complex Financial System



Source: Haldane (2009)

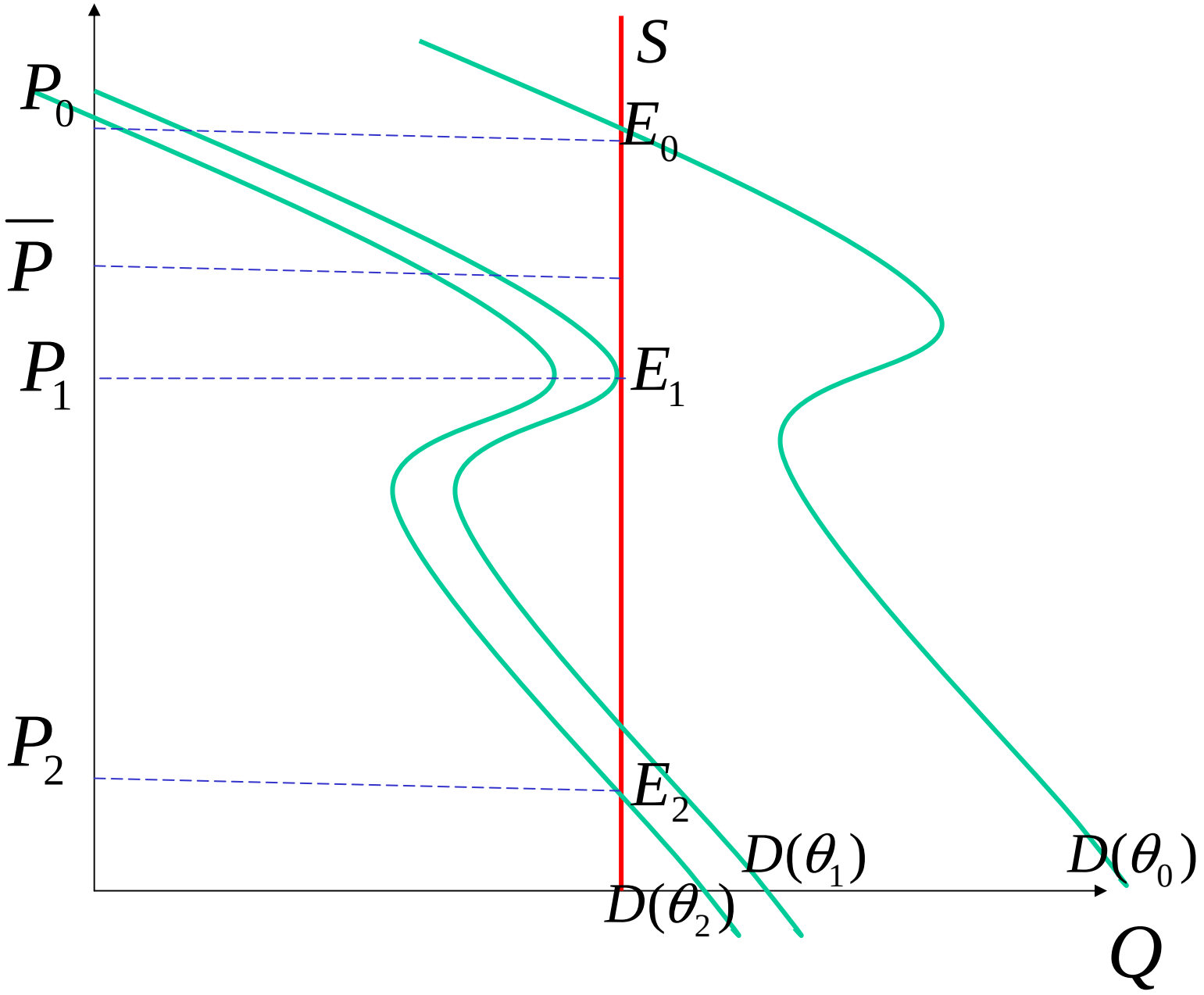
Endogenous Liquidity:

Suppose demand for some asset D: stocks or bonds is made up of two parts normal demand, N, and hedging demand, H.

- Let P denote price and θ an exogenous shock (say GDP or real estate prices).
- Let $N(P,\theta)$, with $N_1 < 0$ and $N_2 > 0$, whereas $H(\bar{P} - P, \theta)$, with $H_1 > 0$ and $H_2 > 0$
- Let supply S be fixed.

Then supply equals demand is given by:

$$N(P,\theta) + H(\bar{P} - P, \theta) = S$$


S
P_0
E_0
$\overline{P}$
P_1
E_1
P_2
E_2
$D(\theta_1)$
$D(\theta_0)$
$D(\theta_2)$
Q

- The important bit of the story is the hedging demand. This could be the exercise of put option protection when the price falls below $\overline{P}$, or simply stop loss orders being exercised at that price.
- The problem that the picture illustrates is that if there are lots of sellers in the market-making for the exits at the same time the market is unstable at E_1 and on the verge of a discontinuous price move to E_2

- For this model to make sense our hedgers have to be pretty deluded. At the price $\bar{P}$, they act each acts as if they are the only seller, yet in our simple model we only have sellers and no buyers.

- We have extreme asymmetric information and a very high correlation of strategies.

- Wouldn't things be a lot better if at each price level there were buyers (speculators) willing to buy the assets from the hedgers? Denote their demand by A(P). The economic question is why there are not sufficient speculators with enough money to hold these positions:

$$\mathrm{N}(\mathrm{P},\theta)+\mathrm{H}(\overline{\mathrm{P}}-\mathrm{P},\theta)+\mathrm{A}(\mathrm{P})=\mathrm{S}$$

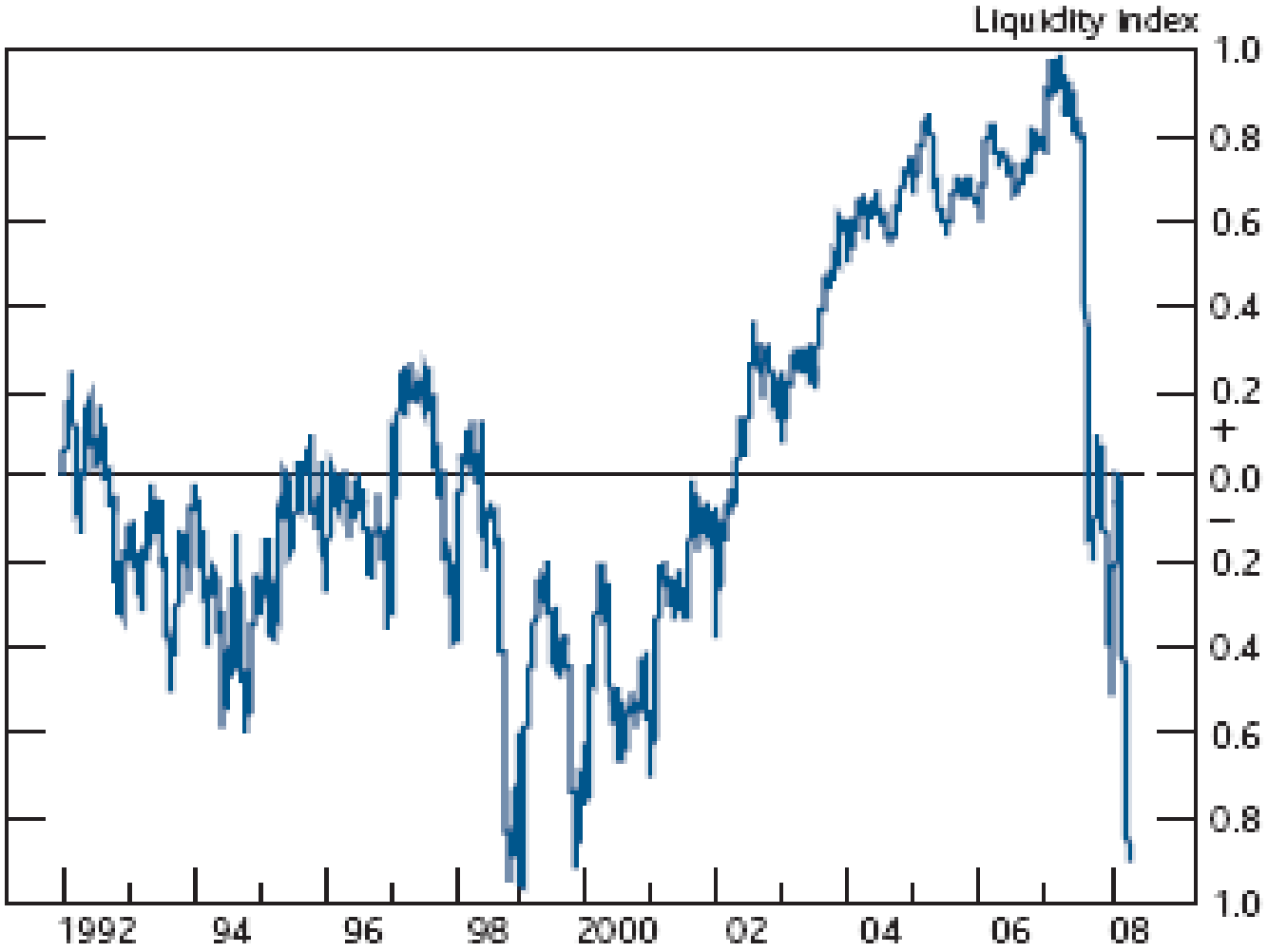
- (Competitive) speculators behaviour depends upon their information and the inferences they draw from market prices and order-flow. If these inferences are bad then they offer little sanctuary to hedgers.

What has the above to do with banking: correlation, liquidity and instability?

- Interconnectedness
- Information problems
- Correlation of risks

- Capital adequacy ratios are pro-cyclical-they promote positively correlated stop loss orders.
- Marked to market accounting, whilst a good idea most of the time and surely aid sound risk management, are bad in bad times. In opaque-illiquid markets-they promote positively correlated stop loss orders.
- Banks use of the same models to calculate and mange economic capital can promote positively correlated stop loss orders.
- Counter-party positions may be opaque.

Chart 2 Financial market liquidity[a]



Sources: Bank of England, Bloomberg, Chicago Board Options Exchange, Debt Management Office, London Stock Exchange, Merrill Lynch, Thomson Datastream and Bank calculations.

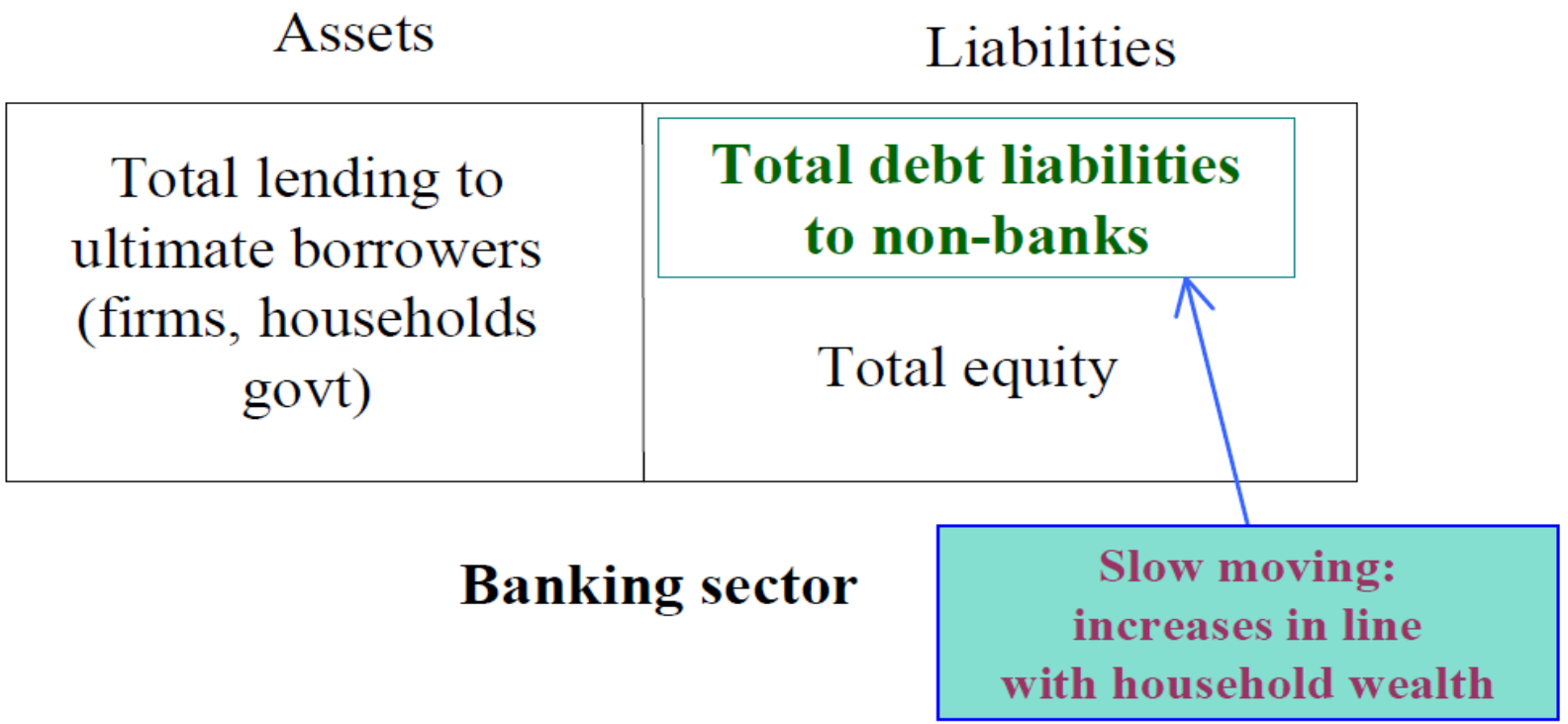
(a) The liquidity index shows the number of standard deviations from the mean. It is a simple unweighted average of nine liquidity measures, normalised on the period 1999–2004. The series shown is an exponentially weighted moving average. The indicator is more reliable after 1997 as it is based on a greater number of underlying measures.

Interconnectedness, Liquidity and Correlation

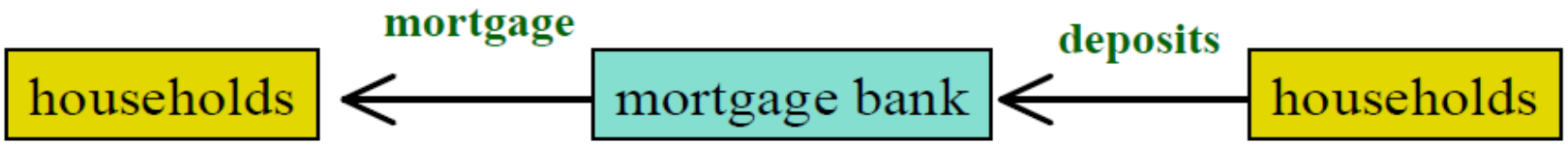
- Banks are highly levered and interconnected. The interconnected nature of banks creates further negative externalities.
- If a big bank calls in its loan to another bank to satisfy its tier-one capital ratio this can cause another bank to breach its limit. This problem will only be partly mitigated by trading in the secondary market.
- A sale of assets by one bank that depresses prices causes problems for other banks through capital ratios, marked to market accounting or their risk models.

- If these problems are highly correlated and there are no continuous offsetting speculative positions-we have the kind of negative feedback illustrated above.
- Matters are made worse in adverse circumstances by problems of asymmetric information: Counterparty risk and gridlock.

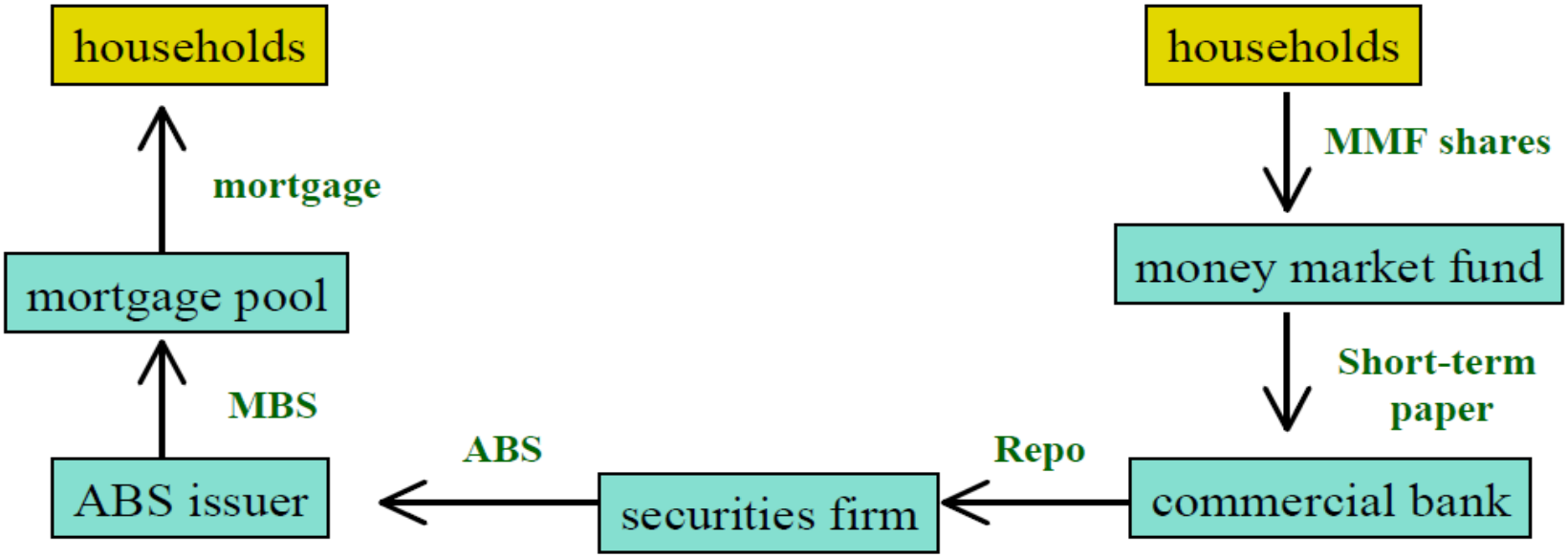
Balance Sheet for Banking Sector



Short Intermediation Chain



Long Intermediation Chain



Advantages of the Originate and Distribute Banking Model

- What Are the Advantages of the Long Intermediation Chain?
- Securitisation enables dispersion of credit risk.
- Long chains promote more efficient maturity transformation.

But Evidence in this Crisis Points the Other Way

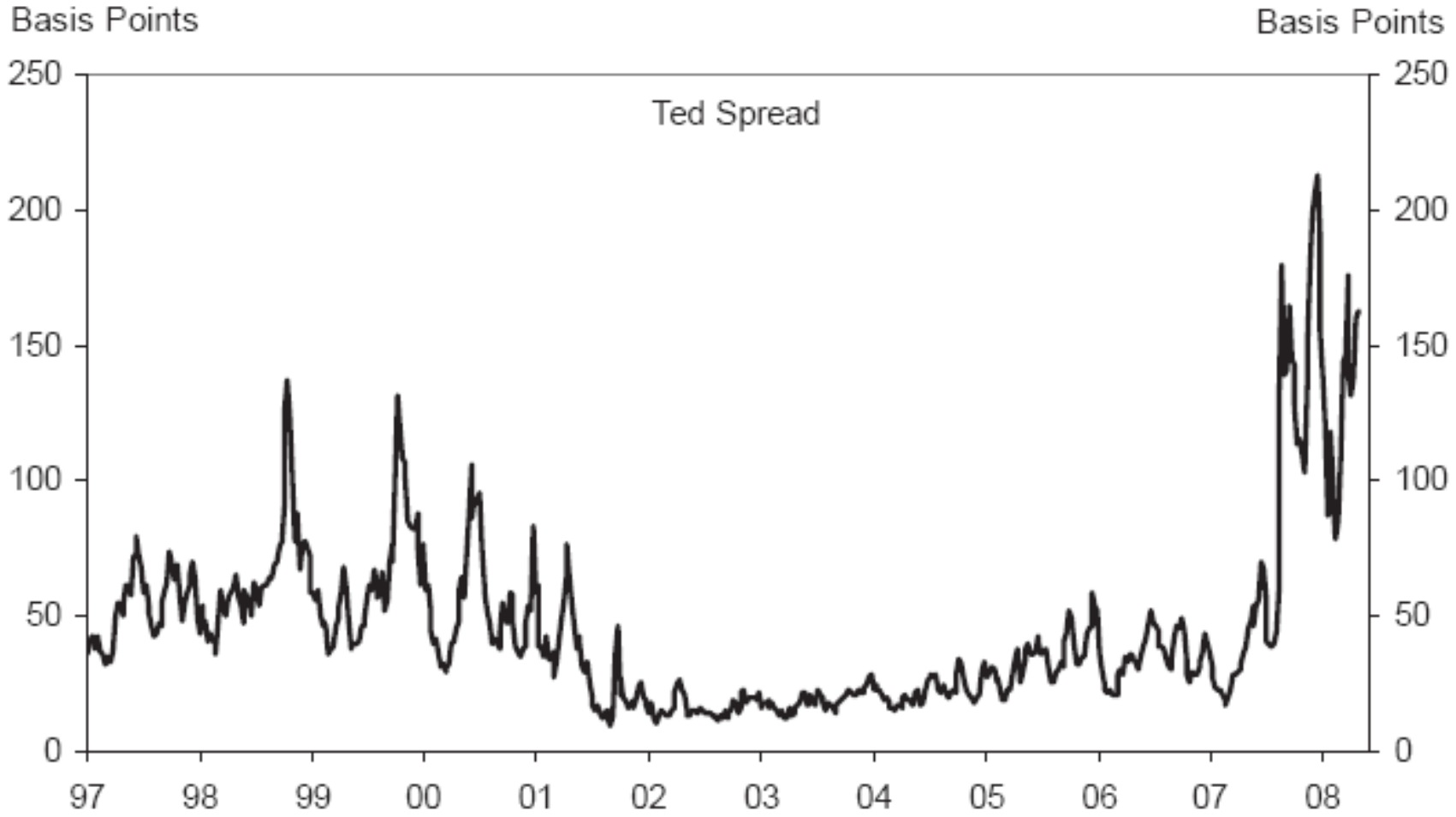
- Securitization has concentrated risks in leveraged sector
- Biggest growth in short-term debt was between financial intermediaries.
- This emphasises the need for systemic risk indicators. CoVar and Forward Looking Risk Models that take into account macro factors.

"There is growing recognition that the dispersion of credit risk by banks to a broader and more diverse group of investors, rather than warehousing such risk on their balance sheets, has helped make the banking and overall financial system more resilient. The improved resilience may be seen in fewer bank failures and more consistent credit provision. Consequently the commercial banks may be less vulnerable today to credit or economic shocks"

IMF Global Financial Stability Report, April 2006.

TED (3 month) Spread

Exhibit 2.8 Treasury-Eurodollar (TED) Spread



Source: Financial Times, Federal Reserve Board

ABCP Programmes

- Banks use derivative programs to exploit inefficiencies in the capital markets.
- ABCP programmes affect financial stability.
- The sustainability of the ABCP programme depends crucially on the sponsoring bank's capital.
- An unraveling of the ABCP market can cause a seizure of the inter-bank market.

"Markets are struggling to establish prices that can clear a legacy of financial assets created during the credit market boom. Liquidity has fallen sharply in a number of markets…and at least until very recently, leveraged loan markets have been effectively closed.

Many credit markets are dislocated…

…..Potential buyers of ABS, and of more complex and opaque structured products, find it hard to assess their value and are no longer willing to rely on issuers' reputations and rating agency assessments. Gaps in information about the composition of instruments may have become more significant as asset prices have fallen and credit quality has weakened."

Financial Stability Report April 2008

Booms

• Higher leverage of financial intermediaries.

• Larger balance sheets of intermediaries.

• Greater intertwining of intermediaries.

– Longer chains.

– Maturity mismatch to sustain longer chains.

Busts

- Deleveraging.
- Shrinking balance sheets.
- Unravelling of inter-bank lending.

– Runs.

– Retrenchment.

General issues of Reform

- Need to better mechanisms of identifying systemically important institutions and when they pose a problem.
- Complexity of institutions and the system is a problem: complex institutions that pose systemic risk are hard to regulate and “difficult to wind down”:- living wills may help.
- Moral hazard and systemic risk are interconnected: too big to fail/ too big to save.

Specific Approach 1: Moderate Fluctuations in Leverage

- Through Counter-cyclical Capital Regulation.
- Leverage cap (e.g. Switzerland)
- Counter-cyclical capital targets (Geneva Report).

Specific Approach 2: Moderate Fluctuations in Equity

- Through Forward-looking Provisioning
- - Spanish Statistical Provisioning
- - Pigouvian Tax (Geneva Report)

Specific Approach 3:Improving Information

- Through reducing complexity of both instruments and structures.
- Register of counter-party exposures.
- Centralised clearing platforms for CDOs and CDSs.

Some Features of Possible Future

-- Especially securities sector

- Smaller intermediary sector
- Shorter intermediation chains

-- Less profitable

-- Less maturity transformation

- Financial System with more information sharing. Improved systemic oversight and regulatory brakes.
- Monetary policy should pay more attention to bank balance sheets and asset prices?
- Marked to Market Accounting standards should take into account market liquidity.