Liquidity and Stress Testing

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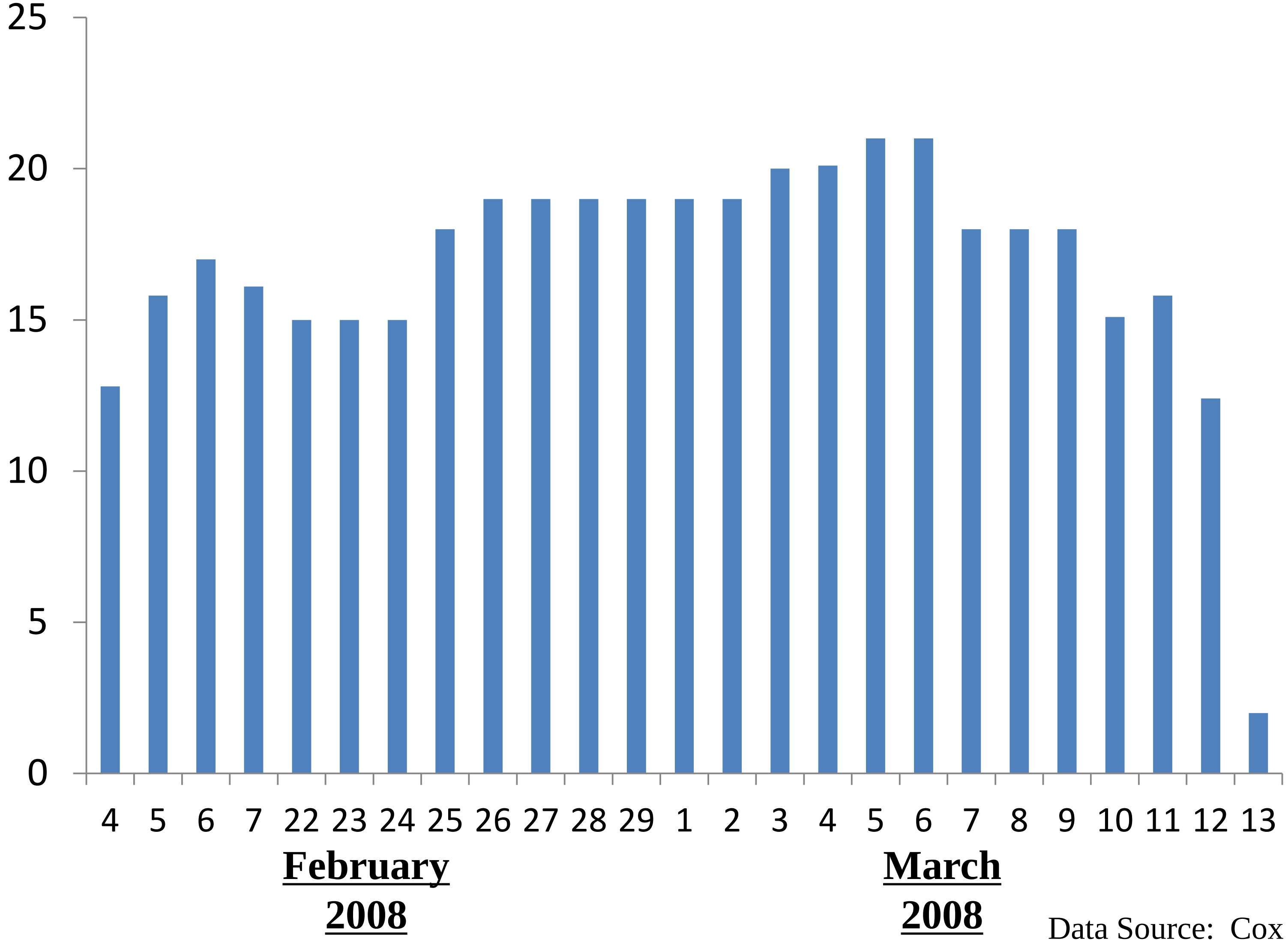
Potential conflicts of interest at www.stanford.edu/~duffie/

Bear Stearns' Liquidity Pool ($ billions)



Data Source: Cox (2008)

Liquidity Stress Testing

- Objective: To test the ability of banks to meet near-term payment obligations, under funding loss and other counterparty cash drains.

- Liquidity loss can cause failure for almost any "well capitalized" bank, absent central bank LOLR.

- Place emphasis on central-bank-eligible unencumbered assets, bank-level and system-wide.

- Consider a "resolution liquidity" modeling.

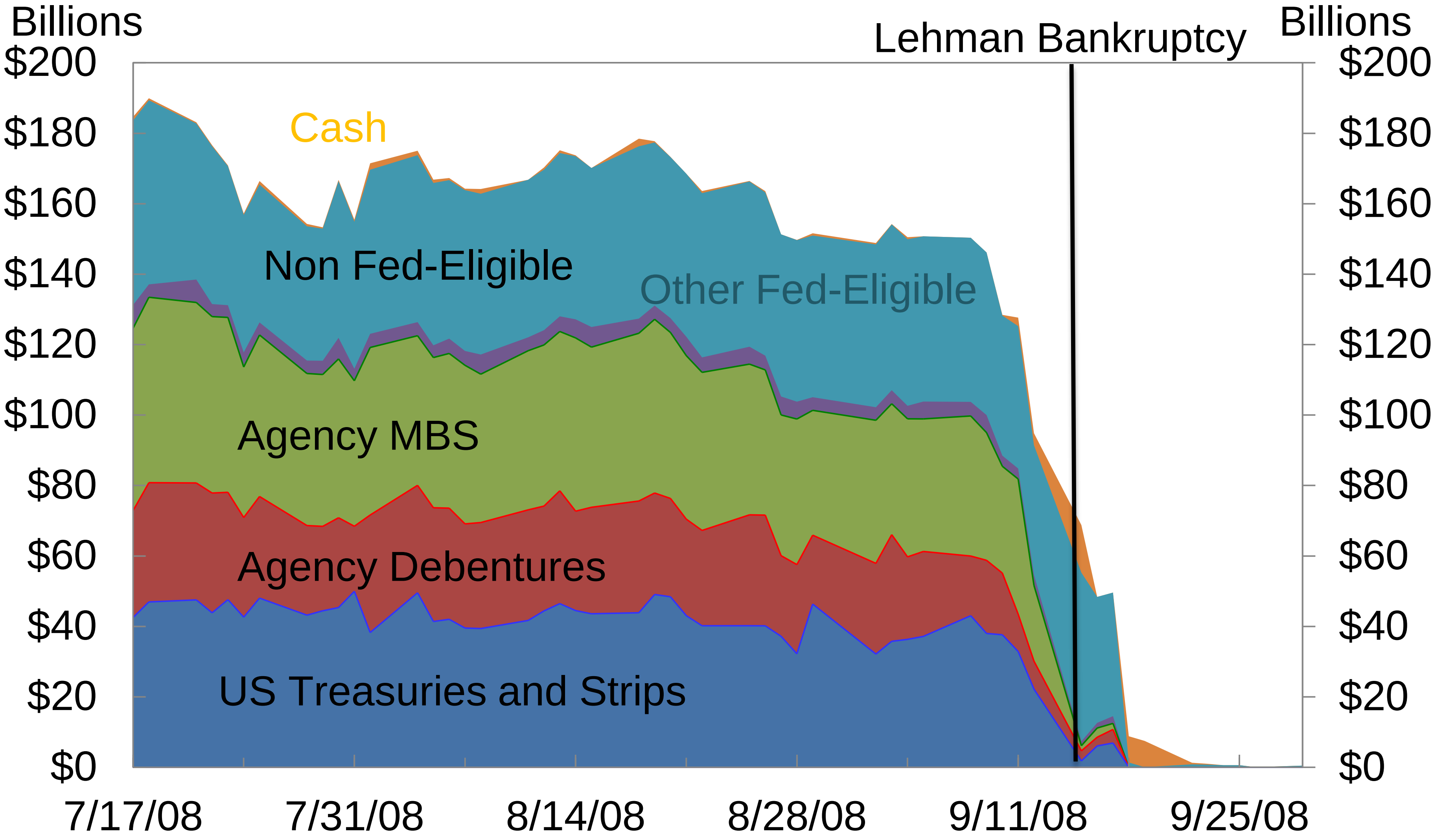
Test Approaches

- Bank-internal liquidity risk models (e.g. R. Fiedler).
- Scenario tests, such as the Basel Liquidity Coverage Ratio (LCR) test, are based on deterministic stresses.
- Balance-sheet liquidity measures (e.g. Brunnermeier-Gorton-Krishnamurthy, NSFR) are "health indicators."
- Probabilistic or dynamic stress models, such as RAMSI, are richer and highly model dependent.
- RAMSI and the Basel Net Stable Funding Ratio are based on short-run capital sufficiency, not cash flows.

Sources of Liquidity Stress

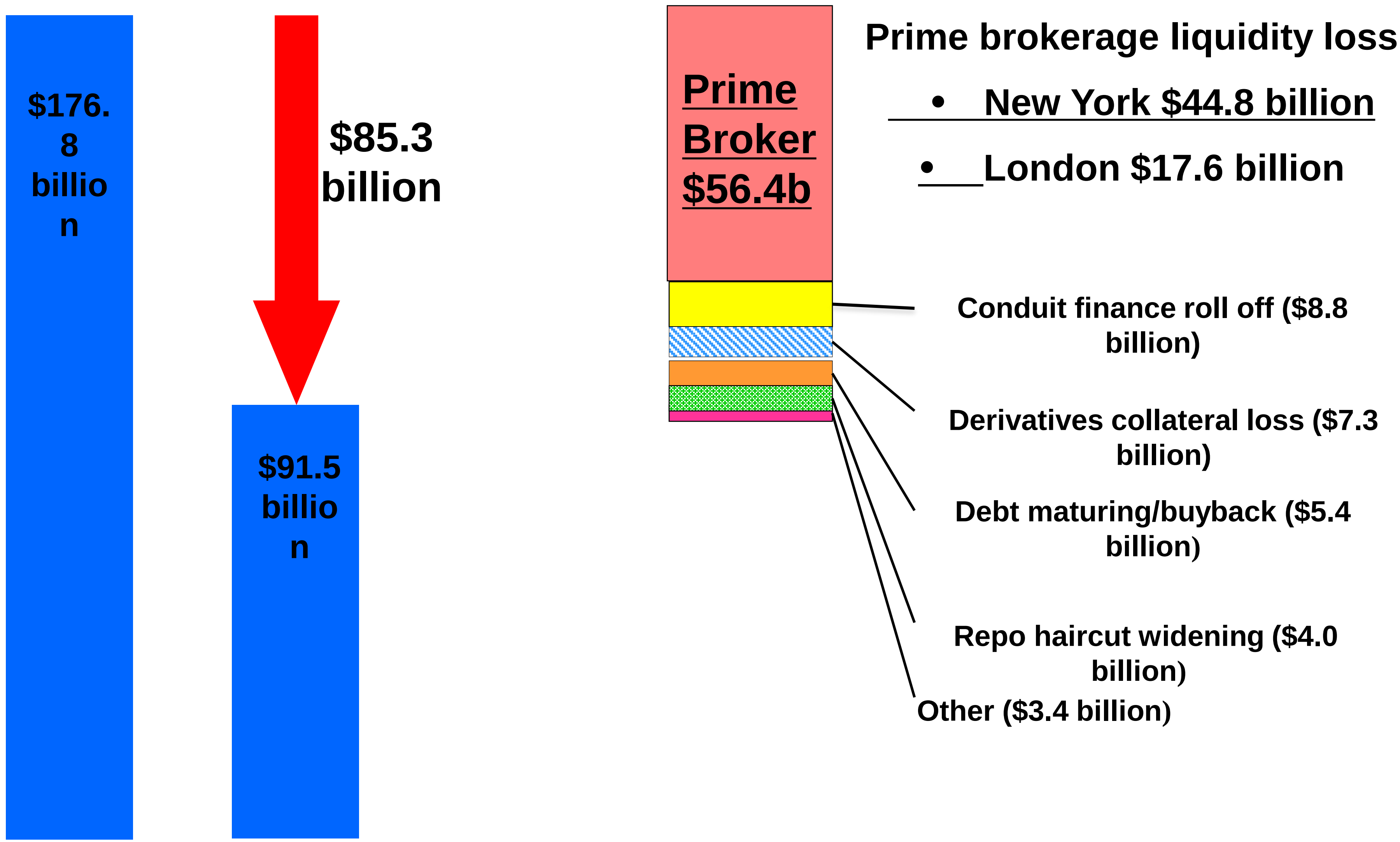
- Scheduled contractual gross cash outflows.
- Counterparty runs (deposit runs, cash hoarding, drawing on lines, prime brokerage runoff, “extra” collateral calls, …)
- Lost access to funding: runoff, haircut increases, closure of interbank credit market, payment-settlement infrastructure failure (e.g. BONY on 9/11).
- Correlated shocks to prices and bid-ask spreads.
- Signaling: discretionary cash flows to customers.
- Requirement to continue passing liquidity stress test!

Lehman's tri-party repo book



Source: Copeland, Martin, Walker (2011) FRBNY

Morgan Stanley's Liquidity Loss   Sept. 12-22, 2008



Duffie (2011)   Data: Morgan Stanley-FRBNY FCIC

Tiered Liquidity Sources

- Unencumbered assets (cash, pledgeable assets).
- Rolled over and new funding (not reliable).
- Drawing on lines and derivatives upfronts (not reliable).
- Emergency cash capital infusions (CoCos don’t apply here, liquidity equity puts might work).
- Fire sales.
- Merger.
- Nationalization.
- Failure resolution liquidity (stays, DIP financing).

Liquidity Alerts

- “Unencumbered” assets can be false (e.g. Valukas).
- Funding markets can “close” due to adverse selection.
- Contractual claims to cash can fail (e.g. repo, margins).
- Changes in clearing agreements are hard to refuse.
- Prime brokers rely on customers to fund each other.
- Typical metrics do not cover intra-day cash drains.
- Section 23a liquidity to a broker dealer is limited.
- CCP default guarantee fund calls are unlimited in cases.
- Cash hoarding has network externalities.

Liquidity Coverage Ratio > 100%

Numerator

Cash sources

- Unencumbered assets.
- Liquidity and risk based haircuts.
- At most 40% Level 2.

Denominator

Cash sinks

- Total net cash outflows over 30 calendar days.
- Outflows – Min {inflows; 75% of outflows} .
- Tabular run/draw rates.
- 3-notch downgrade impact.

LCR Alerts

- LCR tests net cash at 30 days, not before (R. Fiedler).
- No haircut on Basel 0%-weight “liquid” government securities.
- As little as 5% of “stable” deposits are assumed to run.
- Other runoff ratios seem arbitrary or “negotiated.”
- “Other contingent funding obligations” left up to nation (MMF support, derivatives margin,…).
- Prime brokerage liquidity risk is not well covered.
- Repos assumed not to fail.

Net Stable Funding Ratio > 100%

Numerator

Weighted funding

- Tier 1&2 capital (100%)
- preferred stock > 1 yr.
- Liabilities >1 yr.
- Stable deposits (90%)
- Other deposits (80%)
- Non-financial wholesale funding (50%)
- Other funding (0%)

Denominator

Weighted assets

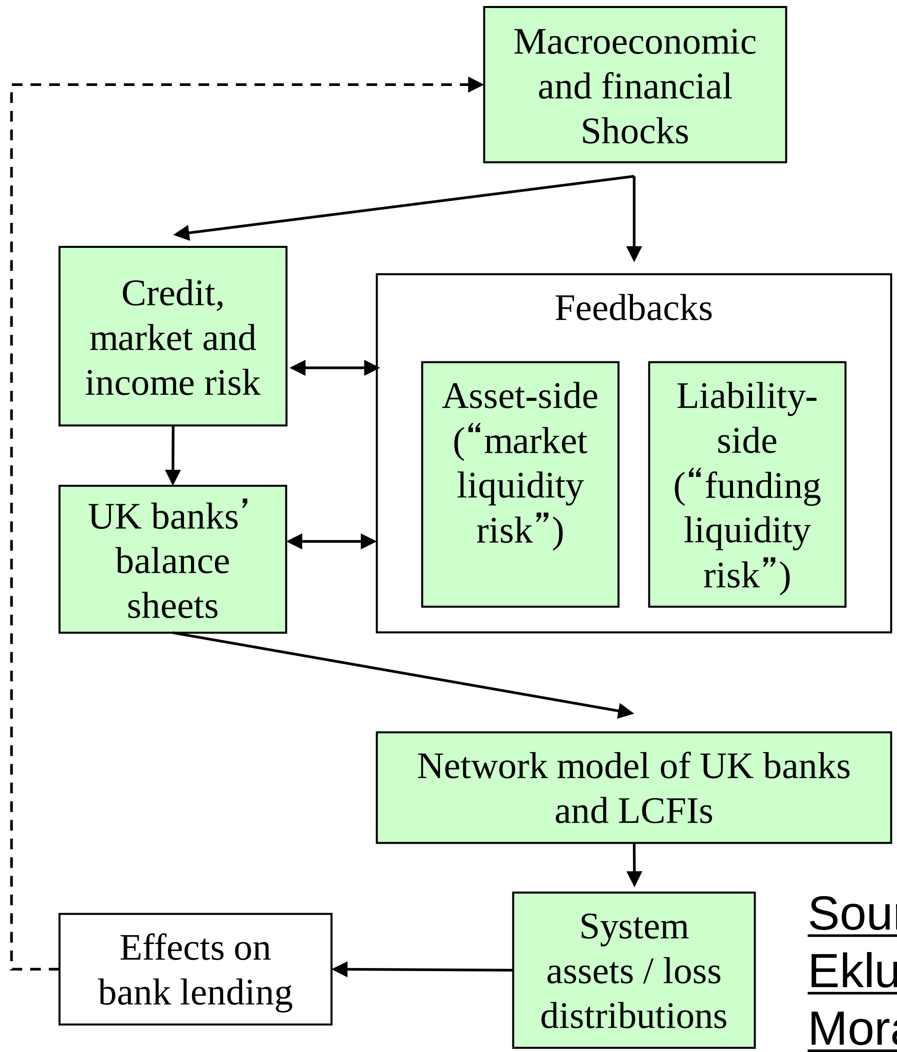
(weights based on liquidity and encumbrance)

- Cash 0%.
- Unencumbered gold 50%.
- . . . .
- Encumbered loans 100%.

Other Basel III Liquidity Metrics

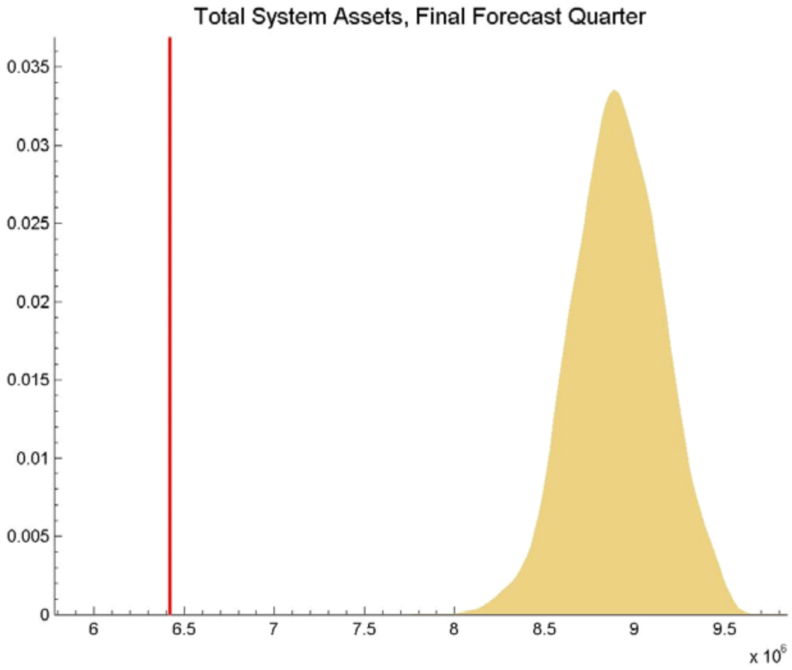
- Contractual maturity mismatch.
- Concentration of funding (by provider, instrument, and currency).
- Available unencumbered assets.
- LCR by significant currency.
- Market-related monitoring tools (e.g. CDS).

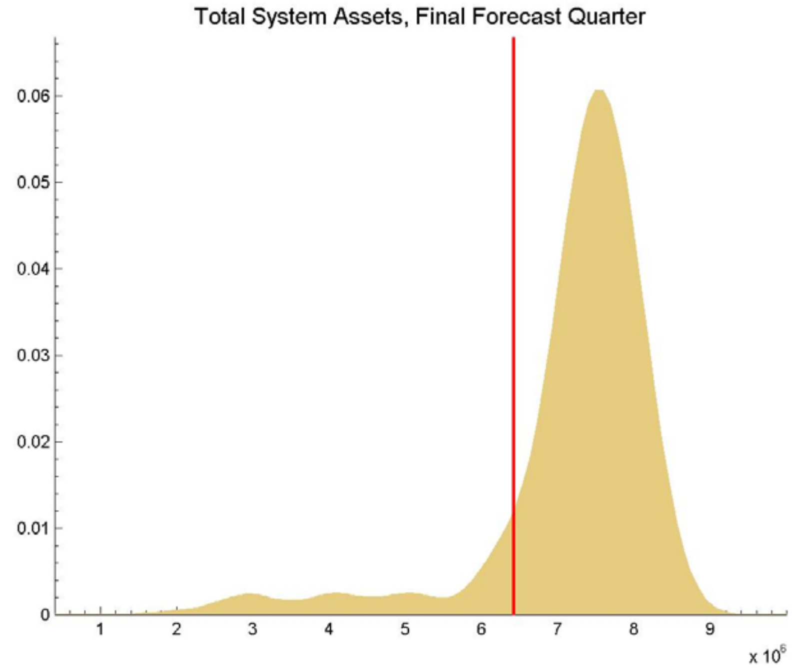
RAMSI Model Architecture



Source: Aikman, Alessandri, Eklund, Gai, Kapadia, Martin, Mora, Stern, Willison (BoE).

Total System Assets, Q12: With and Without Liquidity Risk and Feedbacks





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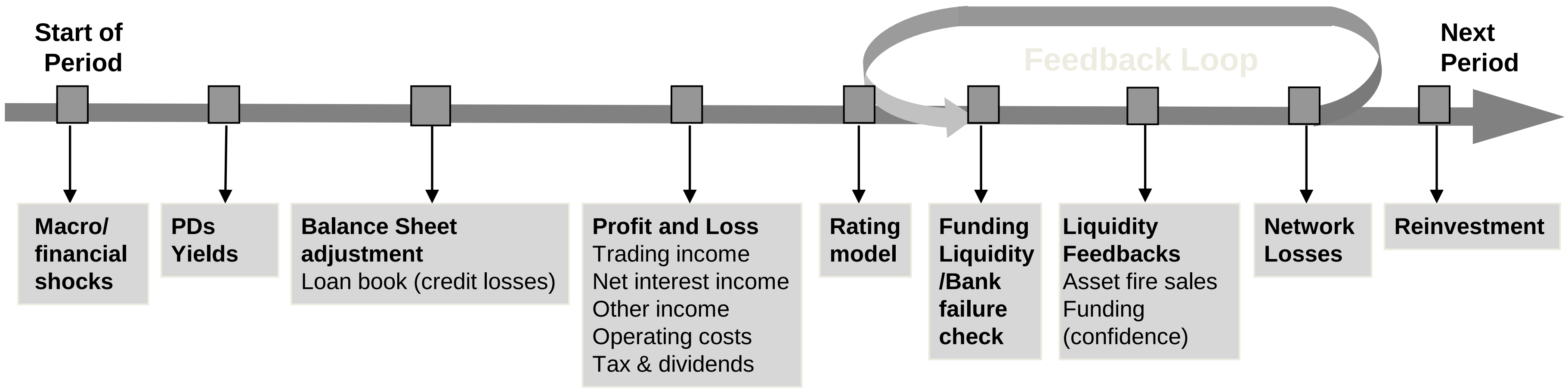
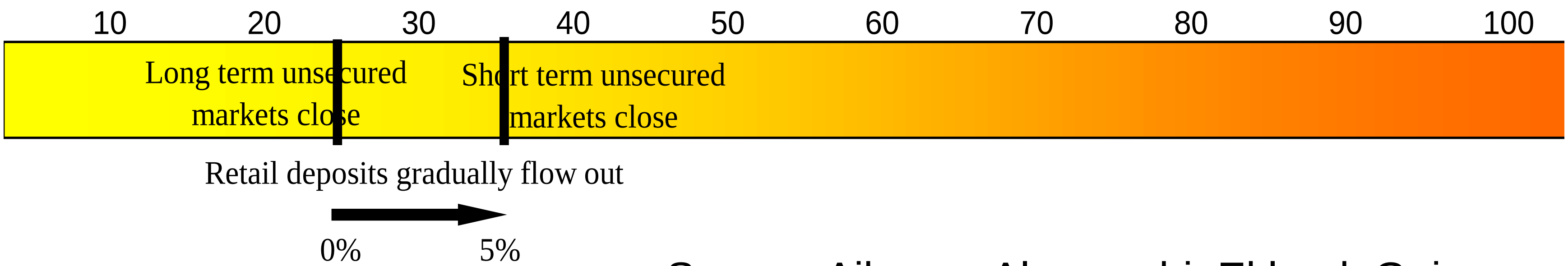
RAMSI Model Dynamics



Source: Aikman, Alessandri, Eklund, Gai, Kapadia, Martin, Mora, Stern, Willison (BoE).

Closure of Funding Markets: A 'Danger Zone' Approach

- Information on individual institutions – as the information on the bank deteriorates, danger zone points accumulate.
- As the score crosses set thresholds, funding markets close to that institution.



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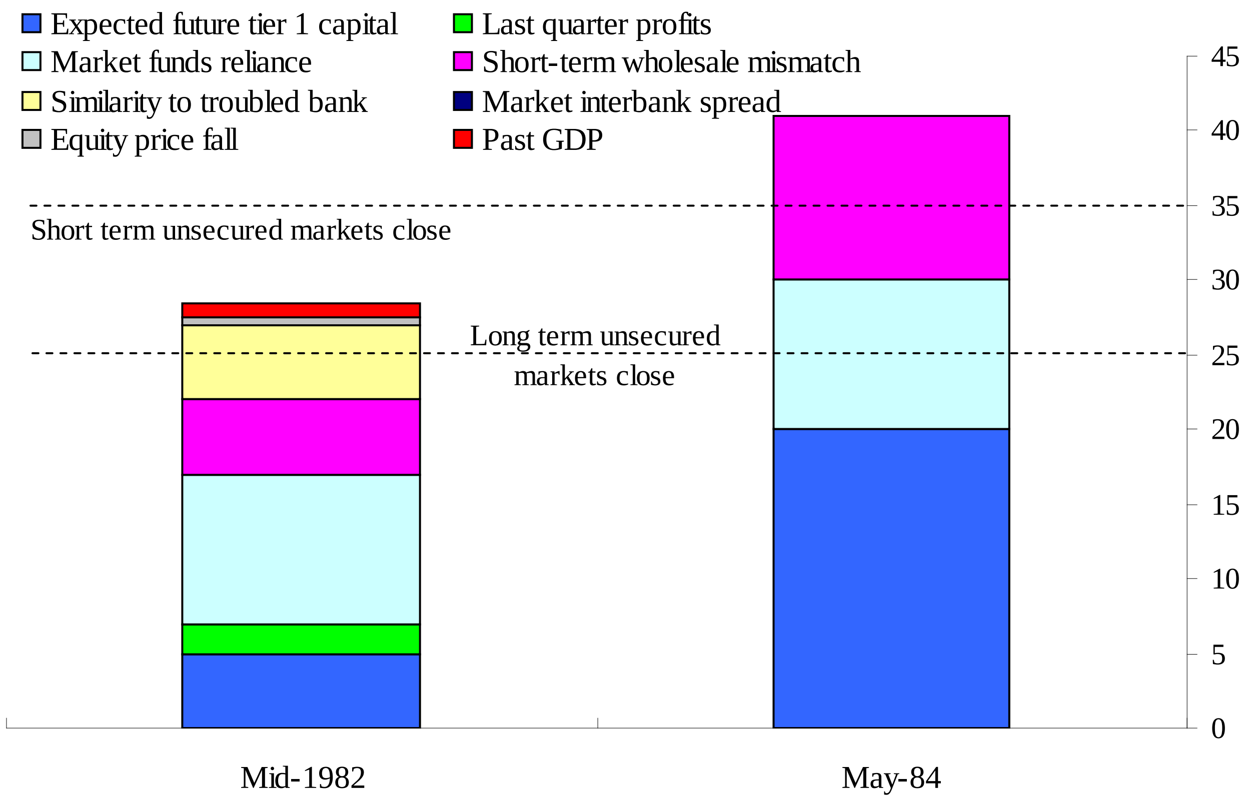
Continental Illinois: Danger Zone Scores



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