



# A SURVEY OF SYSTEMIC RISK ANALYTICS

BISIAS, FLOOD, LO & VALAVANIS

DISCUSSION BY

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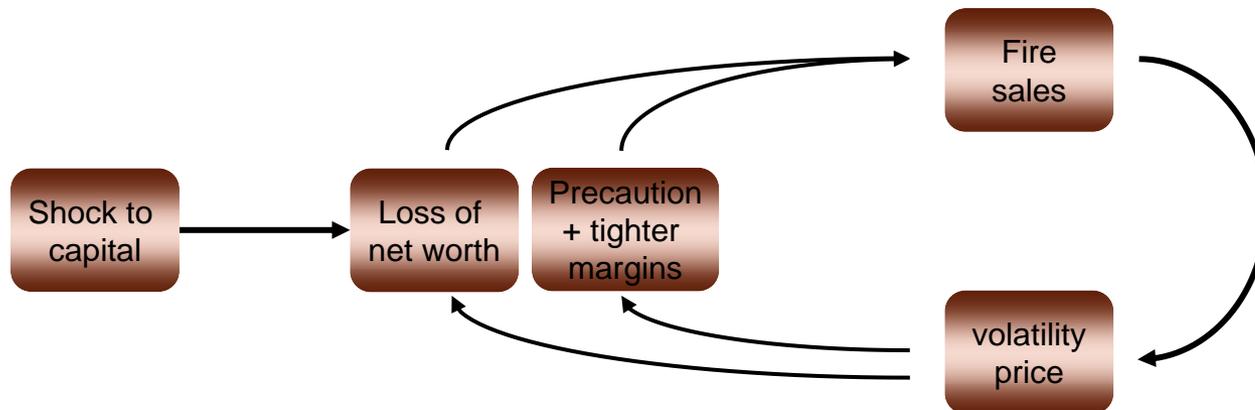
Washington, DC, Dec 2<sup>nd</sup> 2011

# 4 Taxonomies in Bisias, Flood, Lo & Valavanis

- Taxonomy 1 – Supervisory (who is in charge?)
  - Micro-prudential – securities, banks, insurances
    - Includes CoVaR (?)
  - Macro-prudential – OFR is in charge (?)
    - Imbalances are building up
- Taxonomy 2 – data requirements/details
- Taxonomy 3 – time horizon
  - Early warning, simulation/stress test, contemp. fragility  
ex-post forensic analysis
- Taxonomy 4 – research method
  - Prob. distr., conting. Claim, liquidity, network, macro,

# Two Components of Systemic risk

- Systemic **risk build-up** during (credit) bubble ... and materializes in a crisis – *time-series*
  - “Volatility Paradox” → contemp. measures inappropriate
- Spillovers/contagion – *cross sectional*
  - Direct contractual: domino effect - *network*)
  - Indirect: price effect (fire-sale externalities) credit crunch, *liquidity* spirals



- *Adverse GE response* → amplification, persistence

# Micro- vs. Macroprudential

- Micro prudential:
  - Risk in isolation - moral hazard *ratios*
- Macro prudential:
  - Build-up of risk - time series
    - volatility paradox
  - Spillovers to the system - cross section *levels*

Balance sheet	action	micro-prudent	macro-prudent
Asset side	(fire) sell assets	Yes	Not feasible in the aggregate
	no new loans/assets	Yes	Forces others to fire-sell + credit crunch
Liability side	(raise long-term debt)		
	raise equity	Yes	Yes

# || Data: Imbalances and Amplification

- Trigger versus amplification
  - Trigger varies from crisis to crisis and difficult to nail down
  - Amplification effects are similar from crisis to crisis
- Direct spillover: **position data**
- Indirect spillover: due to liquidity problems
  - Depends on endogenous response
    - Depends on expectations/beliefs
    - There is hope: “driven by constraints” (rather than maximization)
  - Focus on **endogenous response indicator**
- General equilibrium phenomenon - macro
  - Risk managers have partial equilibrium perspective
  - Split task

# Who is in charge? Data collection

## 1. Partial equilibrium response to (orthogonal) stress factors

- In value  $\Delta\text{Value}$
- In liquidity mismatch index  $\Delta\text{LMI}$

*financial industry*

- *COLLECT LONG-RUN PANEL DATA SET!*

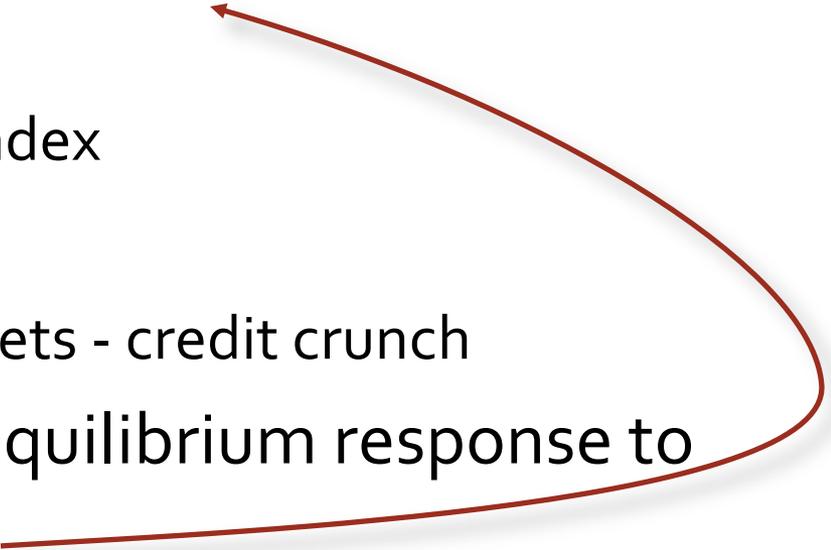
- ... reaction function

## 2. General equilibrium effects

- Amplification, persistence

*macro-prudential regulators*

# General equilibrium

- **Direct** responses to 5%, 10%, 15%,... drop in factor to
    - $\Delta$ Value
    - $\Delta$ Liquidity Mismatch Index
  - Predict response
    - hold out - “fire” sell assets - credit crunch
  - Derive likely **indirect** equilibrium response to
    - this stress factor
    - other factors
- 

*Find out whether plans were mutually consistent!*  
(if not → tail risk)

# Liquidity Mismatch Index (LMI)

A

L

## Market liquidity

- Can only sell assets at **fire-sale prices**

Ease with which one can raise money by **selling** the asset

## Funding liquidity

- Can't **roll over** short term debt
- Margin**-funding is recalled

Ease with which one can raise money by **borrowing** using the asset as collateral

Maturity mismatch

# Liquidity Mismatch Index (LMI)

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**Liquidity**  
~~Maturity mismatch~~

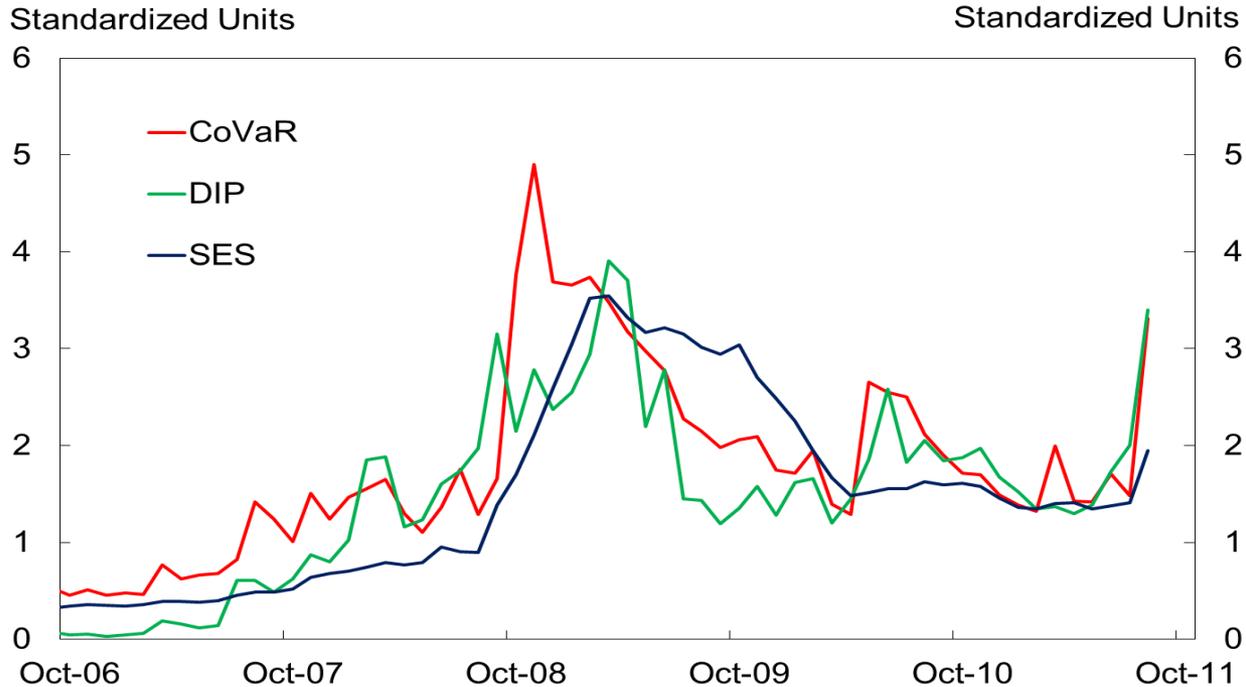
*Liquidity Mismatch Index* = liquidity of assets minus liquidity promised through liabilities

# || Liquidity Pockets

- Sectorial LMI
  - Guess: Banking sector is net short liquidity
    - But, to whom, how much, etc.
    - LMI of shadow banking
  - Guess: Corporate, household sectors are long liquidity
- 2000 to 2008 build up
  - Guess: Aggregate liquidity rises (good), but LMI for financial sector is more negative (bad)
- Identify systemically important institutions
  - $LMI < 0$  identifies “financial intermediary”
  - Lowest LMIs are the systemically important ones
- Liquidity chains
  - Asymmetric asset vs. liability  $\lambda$

# Statistical Spillover measure: $\Delta\text{CoVaR}$

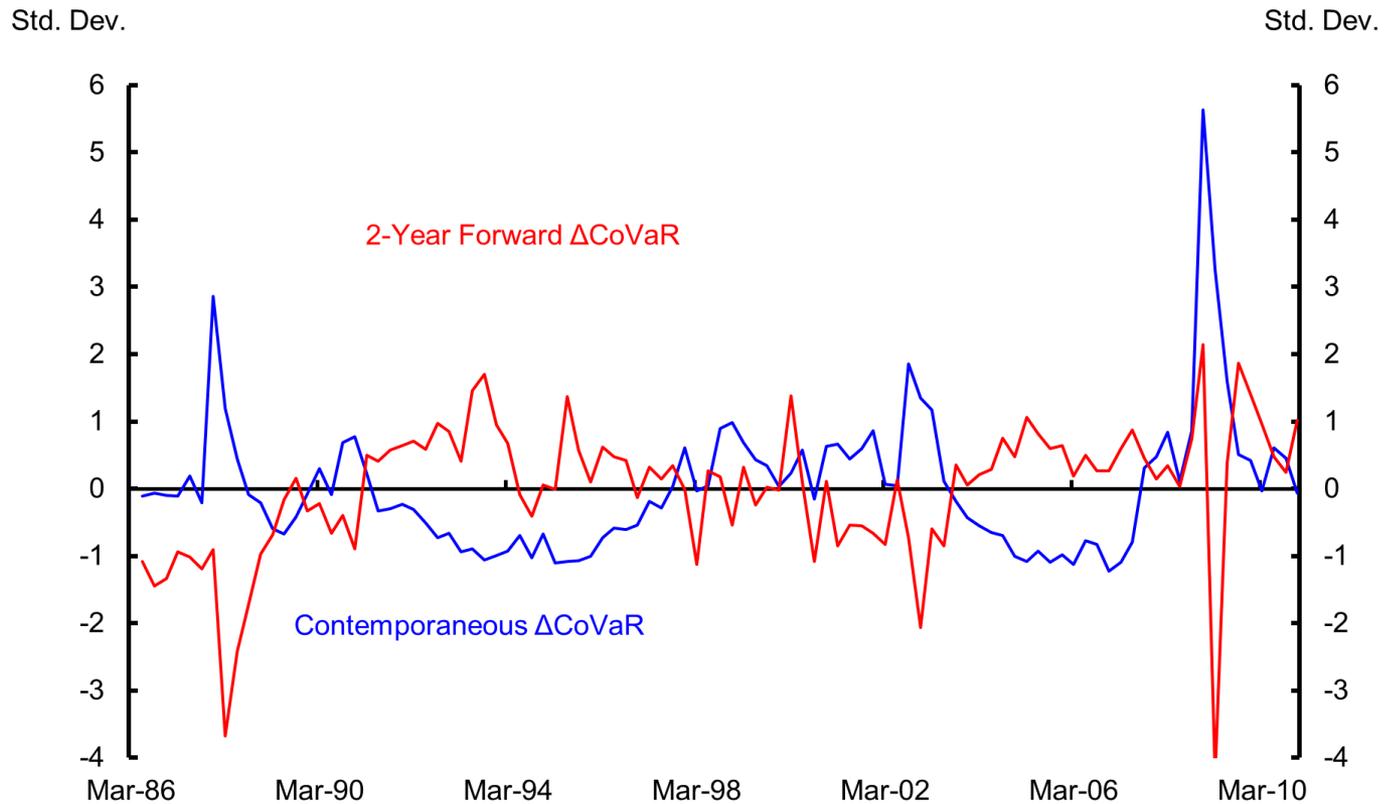
Average Risk Measures Across Top 5 Banks



- (Contribution) CoVaR:
  - How much does firm  $i$  contribute to overall systemic risk (spillovers caused by firm  $i$ )
- Exposure CoVaR/SES:
  - If there is a crisis, how much does firm  $i$  suffer?

# Forward $\Delta\text{CoVaR}$ – avoid procyclicality

## Countercyclical $\Delta\text{CoVaR}$



# || In sum ...

- 4 Taxonomies
- Add “an economist’s taxonomy”
  - Functions driven
    - Volatility paradox – contemporaneous measures are ruled out
    - Slow moving macro measures
  - Triggers vs. amplification
    - Direct Spillovers                      Network
    - Indirect Spillovers                    Macro model / response indicator