Perspectives on Financial Sector Risk Assessment Methodologies

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Overview

- What are we trying to accomplish with financial sector risk assessments?
- What are the approaches currently in use?
- What can we learn from them and what are their limitations?
- How do we move forward to address 21st century financial markets?

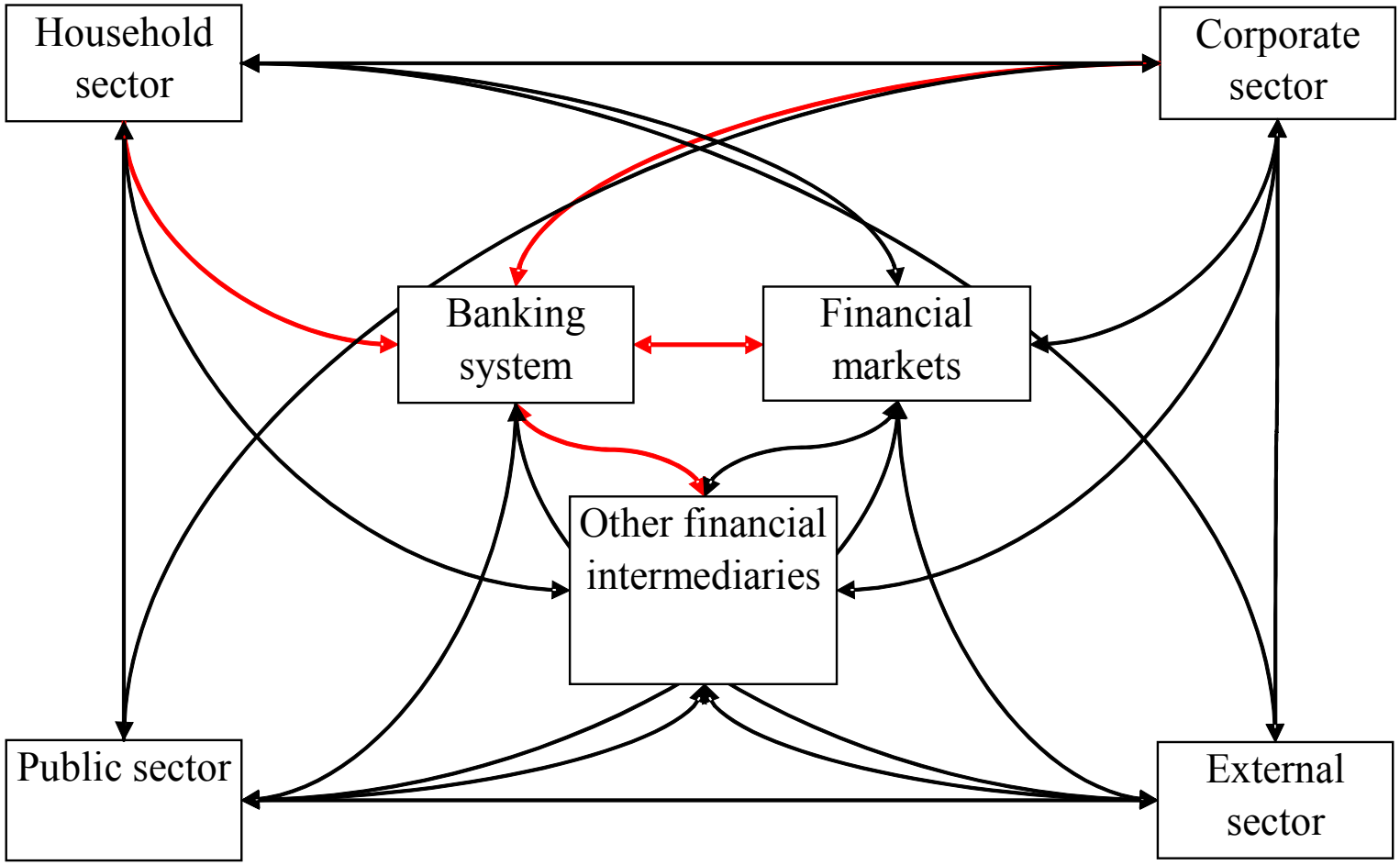
What are we trying to accomplish?

- Anticipate financial sector distress (early warning systems).
- Understand linkages and thus better predict changes from various “shocks” and policy changes.
- Measure public sector contingent liabilities and anticipate potential difficulties.
- Improve efficiency and smooth functioning of financial systems to increase growth and welfare.

At what level of analysis?

- Global
- Regional
- Country
- Sectors
- Types and/or groups of institutions
- An individual ("systemically important") institution

Financial exposures (stocks and flows) between sectors



Basic Financial Sector Risks

- Credit risk / Counterparty risk
- Market risk
  - Exchange rate risk
  - Interest rate risk
  - Equity price risk
  - Derivatives market risk
- Liquidity risk
- Operational risk
  - Legal risk

Methodology

- Tailored to type of concern
  - Ex: Effects of a credit crunch on domestic investment
  - Ex: Systemic distress caused by default of financial institution(s)
  - Ex: Likelihood of sovereign credit default leading to banking crisis
  - Ex: Exchange rate depreciation affecting banking sector through indirect credit risk
- Tailored to available information/data

Types of Methodologies

- Macro-models
- Contingent claims/finance models
- Market prices/quantities
- Stress tests
- Traditional accounting indicators

Accounting Data Orientation

- Across time and across "comparables"
- Profitability measures
  - ROA, ROE, Income statement
  - Revenue sources
  - Costs
- Risks measures
  - Capital ratios (CARs)
  - Exposures to "risky" areas
  - Contingent claims

Stress Tests

- Construction of scenarios and institutional data as important as results.
  - Usually exposures are taken at a point in time (not typically dynamic); exposure data collected infrequently.
  - Propagation typically ignored—focus on solvency, capital-adequacy, performance.

Stress Test on Banking System: Albania

	%Δ Effect on CAR	%Δ Effect on ROA
Exchange rates		
20 percent lek depreciation	+1.72	+.06
20 percent USD depreciation	-2.6	-.06
20 percent Euro appreciation	-2.1	0.0
30 percent lek depreciation with indirect credit risk	-0.48	-.36
Interest rates		
5 percentage point rise in lek yield curve	-0.85	-.03
5 percentage point rise in USD yield curve	-0.6	+.15
5 percentage point rise in Euro yield curve	-0.85	-.02
5 percentage point rise in all yield curves	-2.44	+.10
NPLs		
10 percent deterioration in standard loans	-1.97	-.49

Stress Tests

- Advances
  - Creative, tailored scenarios (e.g. effect of changes in strategy of a dominant bank).
  - Across sectors.
  - Allow dynamics; allow probabilistic exercises.
  - Use exposures across institutions to examine liquidity/default effects.

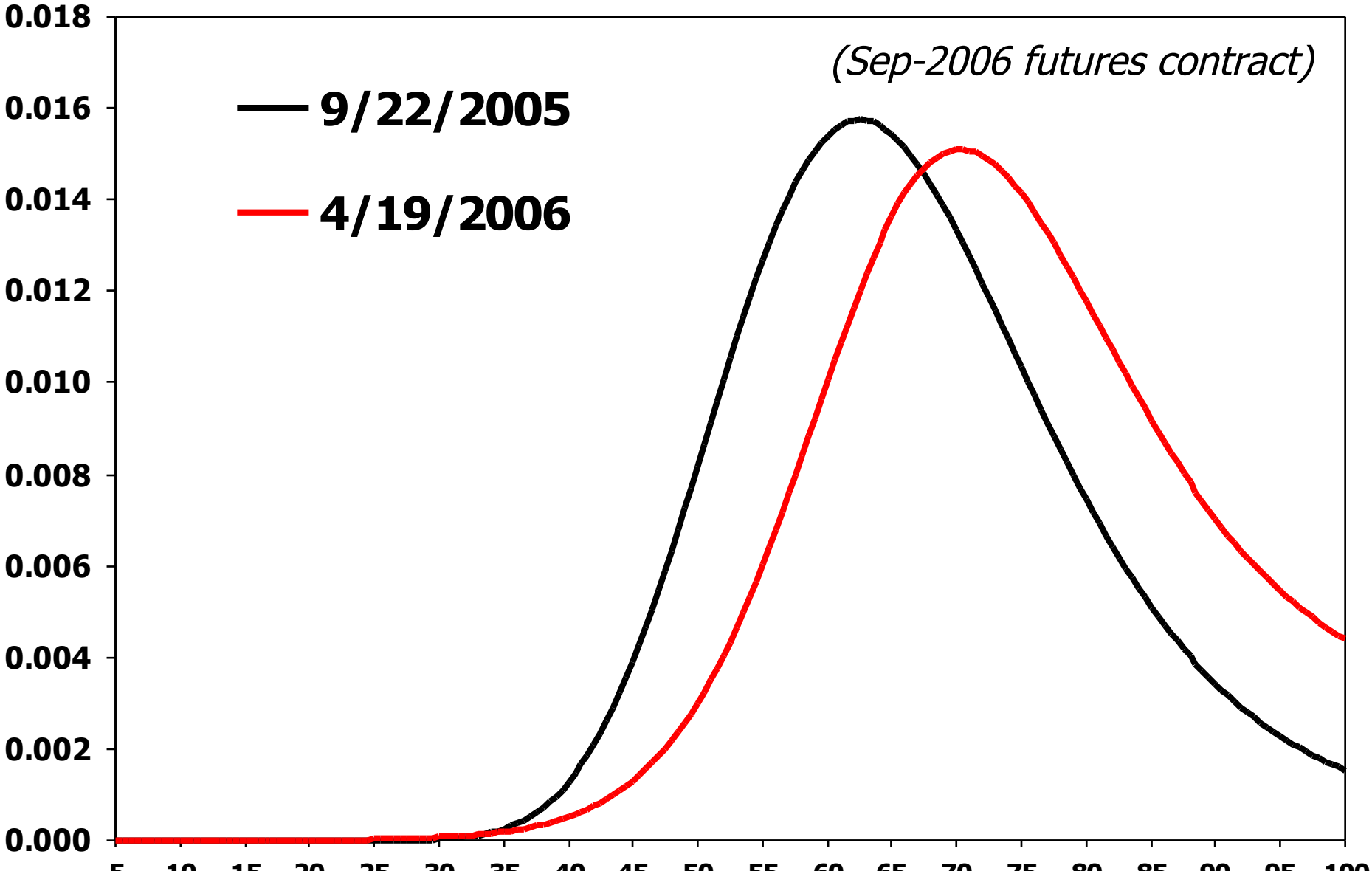
Prices/Quantity Analysis

- Economic data that "signal" upcoming financial sector distress
  - Basis for early warning systems for domestic currency crises (debt/GDP, deficit/GDP, reserve coverage, etc.).
  - Observe money supply growth, credit growth, reserve accumulation as signals of abundance liquidity/risk taking.
  - Stock and flow economic data not necessarily providing risk measures.

Traded Prices

- Use market "prices" to anticipate financial sector distress
  - Means/Difference
    - House prices, credit spreads, maturity/swap spreads
  - Variances
    - Options prices, risk measures, credit derivatives
  - Skewness & Kurtosis (fat-tailed)
    - "Smile" of options prices, risk-neutral PDFs

Brent Crude Oil Call Option Prices: Probability Density Function



Traded Prices

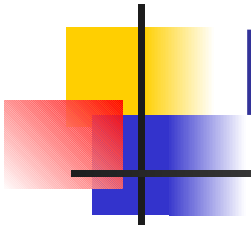
- Prices not perfect reflections of reality
  - Who is represented in the market? (A variety of participants with different needs/views.)
  - Is the market liquid? Does the price represent a "consensus" view?
  - Are there other reasons for using the market that make can bias prices?
  - Some price data better than others in anticipating big moves of systemic proportion.

Traded Prices

- Price data sometime hard to find and not timely/accurate
  - Typically better than quantity or accounting data.
  - "Stale" prices can be a problem (lack of liquidity).
  - Forward-looking prices (e.g. forwards, futures, options) and implied distributions are better than spot prices.
  - OTC markets often don't save data for analysis (or only for proprietary reasons)—difficulty obtaining.
  - Bid/Ask spreads can sometimes interfere with interpretation (though also information in themselves).

Macro Models

- Structural macro models usually built with:
  - Specific behavioral assumptions.
  - Specific solution methods (closed-form vs. non-closed form, partial vs. general equilibrium).
  - Usually linear, but not always.
  - Often representative agents.
  - Information structure typically symmetric.



Macro Models

- Real Business Cycle (RBC) models
- General Equilibrium
- Dynamic Stochastic General Equilibrium
- Dynamic Aggregative Estimated models
- Structural VARs

Macro Models

- Systemic/disruptive financial sector issues requires (at least one of the following):
  - Possibility of default or other non-linear event of distress (collateral, margin calls).
  - Differentiated/heterogeneous participants (different motives, different starting points, different balance sheet structures).
  - Incomplete information.
  - Market imperfections (constraints to trading).

Macro Models

- Pros
  - Can develop “rules of thumb” that can guide policies/responses.
  - Can observe (unexpected) discontinuities.
  - Can (maybe) calibrate model with real data.
  - Develop intuition on linkages that would otherwise be difficult to see by looking at the data.

Macro Models

- Cons
  - Sometimes hard to implement for day-to-day surveillance (often complicated).
  - Sometimes difficult to calibrate since macro concepts do not directly translate into data series.
  - Subject to "Lucas critique" that relationships change and regulatory responses change during event.
  - Must be "right" about behavior assumptions (irrational behavior hard to model).

Broaden Macro Models

- Consider integrating with general equilibrium macro model if macro linkages of interest.
  - Consider features tied to individual types of risks under consideration (contagion, liquidity, solvency, market price disturbances, bankruptcies, runs).
  - Create ways for above features to "matter"—e.g. wealth effects, household default, corporate financing decisions.

Link Balance Sheets, Market Prices

Structural Credit Risk Models

- Combination of balance sheet information, market prices, and adding options theory to calculate implied assets and asset volatility.
- Provides frequent estimates of risk indicators, distance-to-distress, default probabilities, spreads.
- Is mostly applied to firms and financial institutions.
- Can be applied to the sovereign and to other sectors of an economy (data permitting).

Link Balance Sheets, Market Prices

Structural Credit Risk Models

- Can provide a type of financial sector risk assessments (focused on solvency).
- Important modeling issue is the level of aggregation of firms and financial sectors.
- Ongoing work at IMF on impact of shocks and stress scenarios using economy-wide balance sheet risk models (extensions of stress testing).
- Research on ways to link this with traditional macro models.

Look for Better Leading Indicators

- Broaden search to prices with information about variance, skewness, kurtosis and locations of non-linearities (tipping points).
- Keep abreast of new trades and what strategies/risks they are attempting to capture (e.g. incentive structures of participants).
- Back out risks from other aggregated data (e.g. credit risk indicators from CDOs).

Present Day

Balance sheets

(1st moment)

X (we are here)

Prices

(1st moment)

Risks

(2nd, 3rd, 4th moments)

Models

What do we do when we know about risk?

- Policy Issues
  - When do financial sector risks go from natural/healthy to dangerous?
  - Who should be protected? And why?
- Policy Tools
  - Monetary and fiscal policy
  - Supervision/regulation (including accounting and transparency)
  - Competition policy