



International Monetary Fund

The IMF's Experience with Macro Stress-Testing

**ECB High Level Conference on
Simulating Financial Instability
Frankfurt**

July 12–13, 2007

Mark Swinburne
Assistant Director
Monetary and Capital Markets Department
International Monetary Fund



Outline

- **Overview of the FSAP**
- **Stress Testing in FSAPs**
 - **general**
 - **specific experience**
- **Issues Going Forward**



Overview of the FSAP



FSAP Objectives

To strengthen and deepen financial systems and enhance their resilience

- Reducing the potential for systemic crises
- Limiting the severity of crises
- Addressing structural weaknesses



Analytical Tools and Methodology

Risks and vulnerabilities are identified using both quantitative tools and qualitative assessments



- Financial Soundness Indicators
- Macro and sectoral balance sheet analysis
- **Stress Tests**
- Early Warning Systems
- Market-based indicators and analysis (incl. CCA)

- Institutional, structural and market features
- The policy framework- crisis prevention and management
- Formal Standards and Codes assessments



Analytical Tools and Methodology (2)

“ . . . No single model is ever likely to capture fully the diverse channels through which shocks may affect the financial system. Stress testing will, therefore remain a complement to, rather than a substitute for [broader analysis]”

Bunn et al. (2005)



Stress Testing in FSAPs: General



Stress Testing in FSAPs

- A key quantitative tool in financial stability assessments.
- Complemented by qualitative assessments and other quantitative analyses
- Tailored to country-specific circumstances.
- Identification of “good practices” ongoing.
- Learning experience/tool for dialogue.



Stress Testing Approaches

- **Sensitivity tests**
 - Shocks to single risk factors
- **Scenario-based tests**
 - Multiple risk factors
- **Bottom up**
 - Based on individual bank portfolios
- **Top down**
 - Aggregate system-wide model



Stress Testing Approaches (2)

Key features in FSAP testing:

- Internally consistent macro scenarios now central
- Uniformity of the shocks within each peer group
- Some form of bottom-up analysis is critical
- Purely top-down analysis as a consistency check
- “Extreme but plausible” guiding principle
- Some flexibility needed—data and models



Stress Testing in FSAPs: Specific Experience



FSAP Experience with Stress Testing

- Most FSAPs conduct single-factor sensitivity analysis
- Recent FSAPs:
 - Macroeconomic scenario analysis
 - Involve the authorities
 - Involve financial institutions
 - bank-by-bank implementation
 - Include interbank contagion
 - Include nonbank financial institutions



Coverage in FSAPs

Stress tests have become more sophisticated over time:

(percent of all FSAPs initiated in the period)

	<u>2000–2002</u>	<u>2003–05</u>
• Scenario analysis	64	95
• Interbank contagion taken into account	11	38
• Insurance sector stress-tested	25	37



Risks Addressed in FSAP Stress Tests

- Credit Risk
- Market Risk
 - Interest rate
 - Exchange Rate
- Liquidity Risk
- Contagion/Operational Risk



Credit Risk

- The most significant source of risk
- The most in need of strengthening



Credit Risk (Continued)

- Single equation models for household and corporate sectors
- Credit quality as function of macroeconomic variables

Examples:

- Hong Kong: Single equation aggregate estimate and panel estimates using bank-by-bank data
- Denmark: Robust VaR over business cycle in data-restricted environment



Credit Risk Scenarios

Depending on specific (macroeconomic) circumstances of the country, and data availability:

- NPL & loan provisioning (most countries), e.g., NPL migration analysis/loan reclassification.
- Sophisticated analysis on PDs and LGDs, (including effect from macro factors).
- Specific: Cross-border lending (e.g., Austria), Foreign exchange lending (e.g., Jamaica), Loan concentration (e.g., Netherlands, Russia).



Market Risk

- Relatively well addressed through prudential supervision—often implemented using internal models
- Correlation of market and credit risk through indirect credit risk often not covered well.



Market Risk: Type of Analysis

Interest rate risk analysis:

- Repricing/Maturity Gap (e.g., Hungary)
- Duration (e.g., Czech Rep, Israel)
- Value at Risk (e.g., Belgium, Italy)

Exchange rate risk analysis:

- Net open position (e.g., Bulgaria, Sweden)
- Value at Risk (e.g., France, Germany)



Market Risk: Scenarios

- Ad hoc, hypothetical, or historical interest rate increase:
 - Parallel shift in yield curve
 - Steepening/flattening yield curve
- Ad hoc, hypothetical, or historical devaluation/depreciation/appreciation
- Basel Committee Amendment to Capital Accord to incorporate market risk



Liquidity Risk and Equity, Real Estate Price Shocks

Liquidity Risk:

- Change liquidity ratio, either ad hoc (Austria, UAE), or based on historical data (France, Croatia)

Equity/Real Estate Risk:

- Shock to stock market (e.g., Finland, South Africa)
- Housing Price Shock (e.g., Hong Kong, Ireland)
- LTV ratios, mortgage PDs (e.g., Belgium, Australia)



Other Risks

- Commodity prices (e.g., Finland, New Zealand)
- Country exposure risk (e.g., Luxembourg)
- Shocks to specific sectors (e.g., Belarus, New Zealand: Agriculture; Finland: ICT)
- Interbank contagion (next slide)



Contagion Risk

- Complementary to stress tests of individual institutions
- May highlight some vulnerabilities of the systems in addition to simply the effect of common shocks
- Methodology: Matrix of institution-to-institution exposures
 - Typically net uncollateralized interbank lending
 - Payments systems exposures, ownership links
 - Could also be constructed for liquidity contagion based on experience from past runs
 - Extreme Value Theory co-exceedances?



Issues Going Forward



Going Forward—Methodologies

Further develop methodologies:

- Credit risk analysis
- Correlations between market, liquidity and credit risk
- Contagion
- Cross-border issues
- 2nd round effects, financial → macro
- Reaction functions
- Conglomerates/Insurance Companies (other NBFIs?)
- Operational risk (?)



Going Forward - FSAP Processes

“No one model” → Need to better integrate stress tests and analysis of other indicators.

- Improving availability and quality of FSIs (coordinated compilation exercise);
- “benchmarking” of FSIs, links among FSIs and to other indicators.
- More explicit sectoral balance sheet analysis;
- More explicit use of market indicators, and analysis thereof.
- Awareness of what the tests are not testing for (data and model limitations, potential structural breaks and nonlinearities)



Going Forward—FSAP Processes (2)

Balance between uniformity versus case-by-case approach in FSAPs.

- Further identify good practices for FSAPs. And useful more broadly?
- “Template” for small, less-complex financial systems
- Dialogue with people at supervisory agencies and central banks (e.g., Bundesbank web platform following last year’s forum at IMF)