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)

<table>
<thead>
<tr>
<th></th>
<th>2000–2002</th>
<th>2003–05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario analysis</td>
<td>64</td>
<td>95</td>
</tr>
<tr>
<td>Interbank contagion taken into account</td>
<td>11</td>
<td>38</td>
</tr>
<tr>
<td>Insurance sector stress-tested</td>
<td>25</td>
<td>37</td>
</tr>
</tbody>
</table>
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
- 2\textsuperscript{nd} round effects, financial $\rightarrow$ macro
- Reaction functions
- Conglomerates/Insurance Companies (other NBFI s?)
- 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)