



Financial Soundness Indicators Financial Stability Reports

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March 4, 2009

Note: The views expressed here are those of the presenter and do not necessarily represent those of the IMF or IMF policy.

Roadmap

- I. Financial soundness indicators (FSIs)
 - FSIs and data gaps
 - “Benchmarking”
 - Other (complementary) indicators
 - II. Financial stability reports (FSRs)
 - Survey
 - Challenges
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Part I

Financial Soundness Indicators and Financial Conglomerates

Indicator Number	Descriptions	Number of Reporting Countries
Core FSIs for Deposit Takers		
I1	Regulatory capital to risk-weighted assets	46
I2	Regulatory Tier 1 capital to risk-weighted assets	47
I3	Non-performing loans net of provisions to capital	44
I4	Non-performing loans to total gross loans	45
I5	Sectoral distribution of loans to total loans	41
I6	Return on assets	47
I7	Return on equity	47
I8	Interest margin to gross income	47
I9	Non-interest expenses to gross income	47
I10	Liquid assets to total assets	45
I11	Liquid assets to short-term liabilities	43
I12	Net open position in foreign exchange to capital	37
Encouraged FSIs for Deposit Takers		
I13	Capital to assets	38
I14	Large exposures to capital	26
I15	Geographical distribution of loans to total loans	25
I16	Gross asset position in financial derivatives to capital	26
I17	Gross liability position in financial derivatives to capital	26
I18	Trading income to total income	35
I19	Personnel expenses to non-interest expenses	38
I20	Spread between reference lending and deposit rates	29
I21	Spread between highest and lowest interbank rates	12
I22	Customer deposits to total (non-interbank) loans	35
I23	Foreign-currency-denominated loans to total loans	33
I24	Foreign-currency-denominated liabilities to total liabilities	32
I25	Net open position in equities to capital	16

Source: <http://fsi.imf.org/>

Indicator Number	Descriptions	Number of Reporting Countries
Encouraged FSIs for Other Financial Corporations		
I26	OFC's financial assets to total financial assets	20
I27	OFC's financial assets to GDP	18
Encouraged FSIs for Nonfinancial Corporations		
I28	Total debt to equity	15
I29	Return on equity	14
I30	Earnings to interest and principal expenses	7
I31	Net foreign exchange exposure to equity	2
I32	Number of bankruptcy proceedings initiated	10
Encouraged FSIs for Households		
I33	Household debt to GDP	14
I34	Household debt service and principal payments to income	8
Encouraged FSIs for Market Liquidity		
I35	Average bid-ask spread in the securities market	10
I36	Average daily turnover ratio in the securities market	13
Encouraged FSIs for Real Estate Markets		
I37	Residential real estate prices (index number)	18
I38	Commercial real estate prices (index number)	7
I39	Residential real estate loans to total loans	24
I40	Commercial real estate loans to total loans	15

Filling Information Gaps

- IMF/FSB Nov 2009 report to G20:
 - Review the list of FSIs (IMF)
 - Develop standard measures of tail risks (IMF)
 - Approaches being reviewed to develop proposals on a possible common approach, including the need for additional information.
 - Develop aggregated measures of leverage and maturity mismatching (IMF; BIS)
 - Develop common template for SIFIs to better understand their exposures (FSB; IMF)
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“Benchmarking” of FSIs

■ Questions:

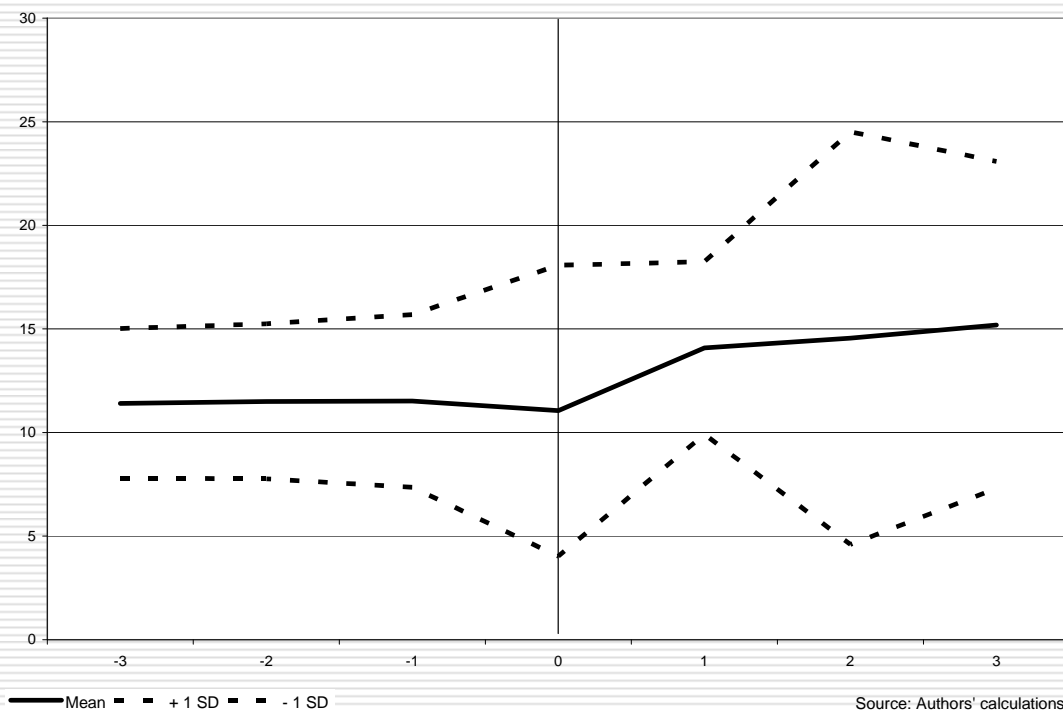
- How to interpret values of key FSIs?
- Thresholds to signal an impending crisis

■ Approach:

- Data for 88 countries, 1998-2008
- Logit model; nonparametric estimates.

Based on IMF WP 07/275 “How Well Do Aggregate Banking Ratios Identify Banking Problems” by M. Cihak and K. Schaeck (forthcoming in *JFS*).

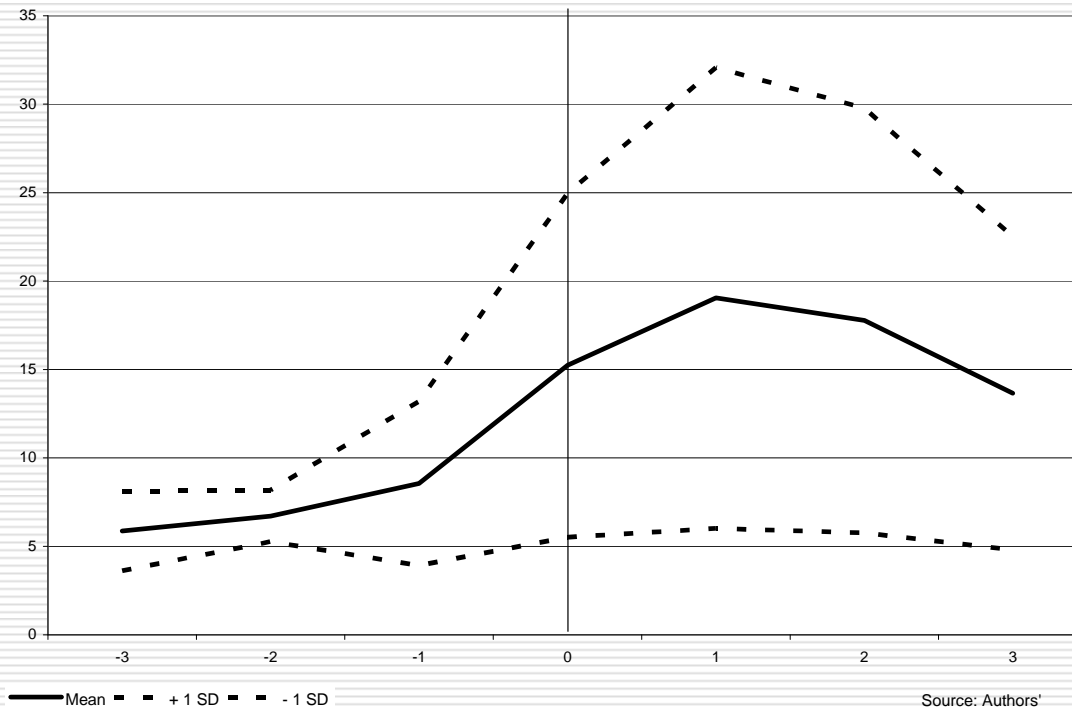
FSIs in Crises: CAR



The graph plots the behavior of the FSI around an event window of +/- 3 years around a crisis whereby t_0 denotes the classification as banking crisis. Regulatory capital itself does not send a signal for the occurrence of a banking crisis.

Source: IMF WP 07/275.

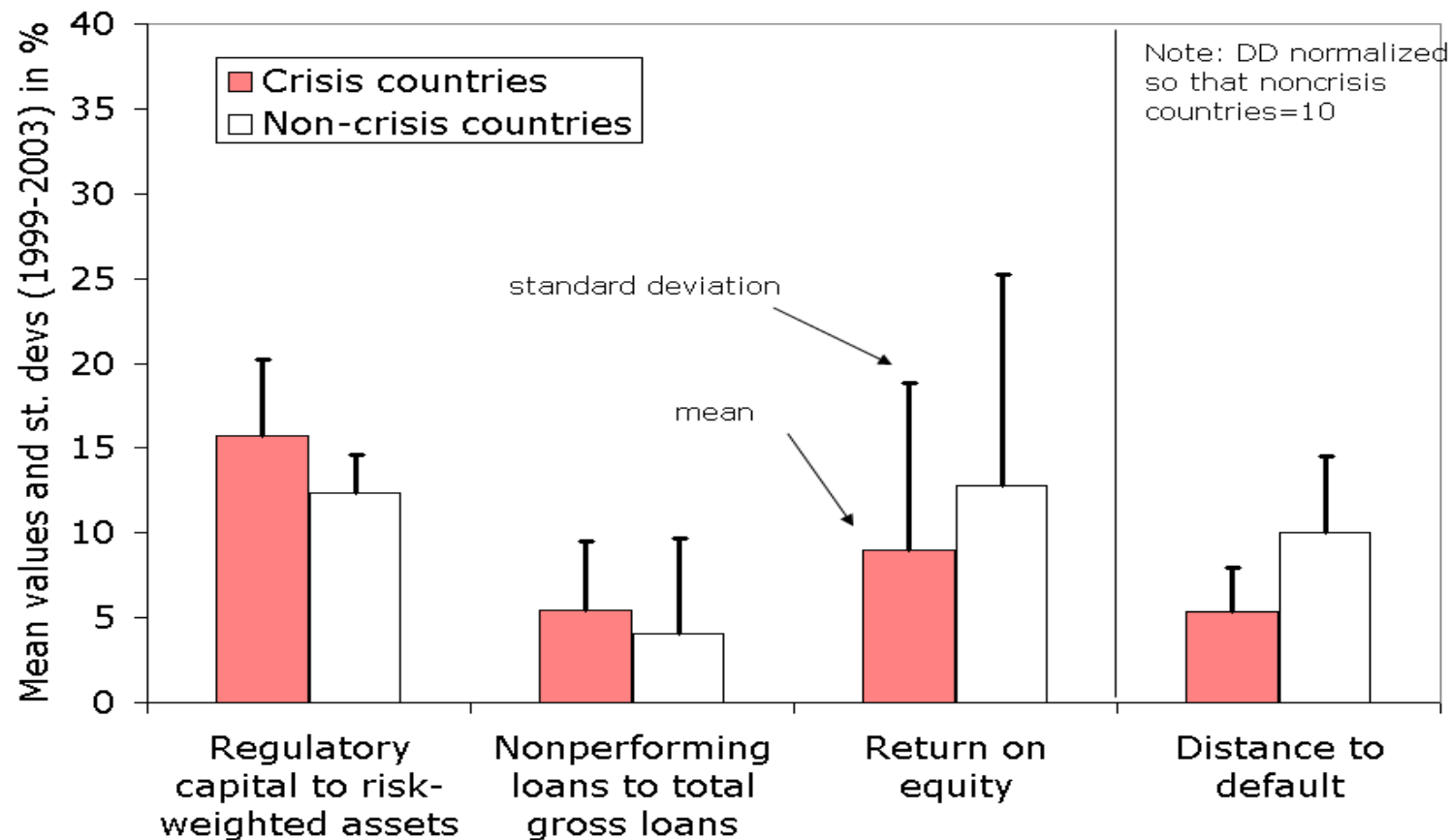
FSIs in Banking Crises: NPLs



Nonperforming loans start increasing prior to a crisis, indicating a worsening asset quality in institutions. NPLs are fully recognized with a time lag after a crisis materializes.

Source: IMF WP 07/275.

Crisis vs. Noncrisis Countries



Source: IMF WP 07/275.

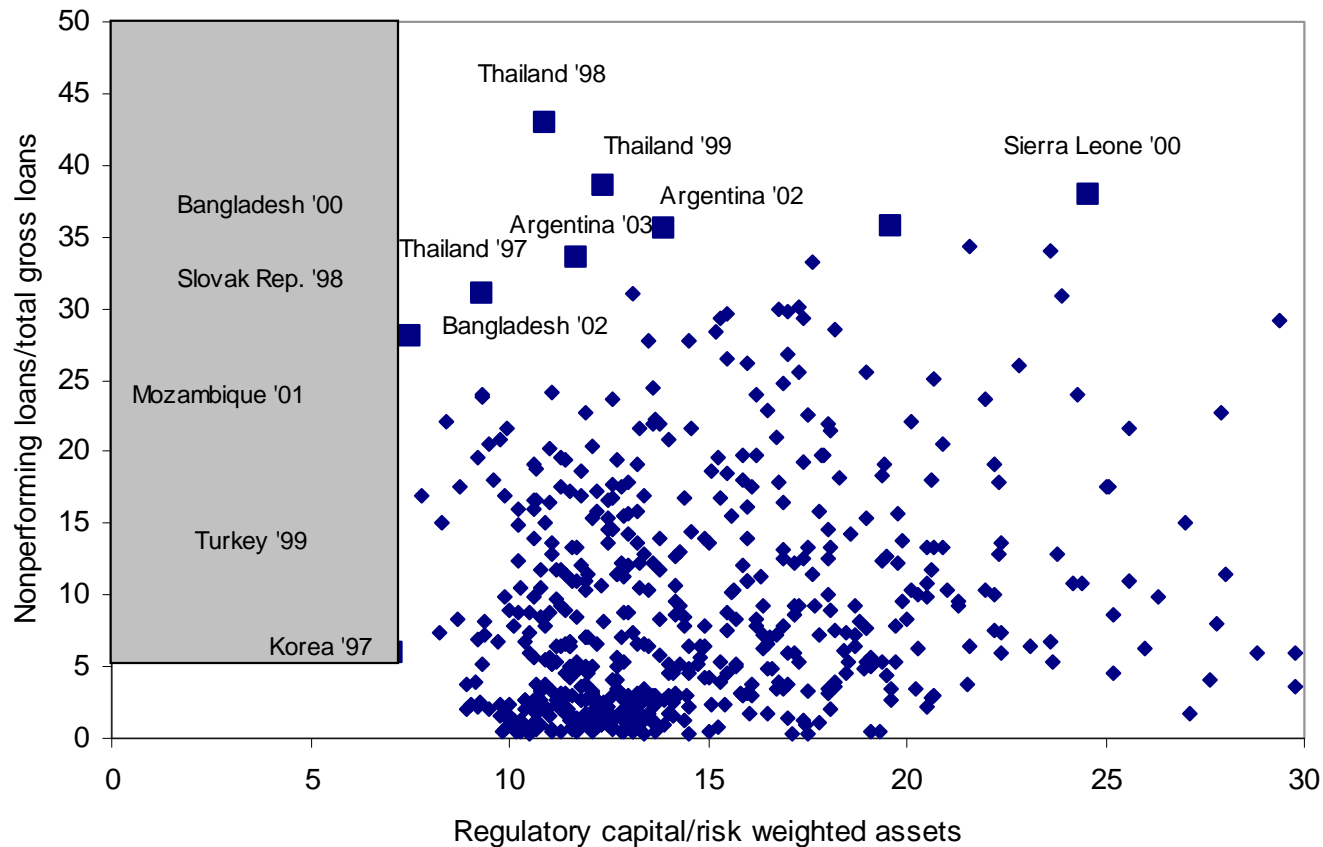
Logit Model: Summary Results

Variable and expected sign		IV	VI	X
Capital/risk weighted assets	-	-0.0005* (0.0003)	-0.0005* (0.0003)	
Nonperforming loans/total loans	+	0.0005* (0.0003)	0.0005 (0.0003)	
Return on equity (banks)	-	-0.0007*** (0.0003)	-0.0007*** (0.0003)	
Debt/equity (corporates)	+	0.0001*** (0.0000)	0.0001*** (0.0000)	
Capital/risk weighted assets _{t-1}	-			-0.0001 (0.0003)
Nonperforming loans/total loans _{t-1}	+			0.0004 (0.0003)
Return on equity (banks) _{t-1}	-			-0.0007*** (0.00020)
Return on equity (corporates) _{t-1}	-			0.0002 (0.0003)
Debt/equity (corporates) _{t-1}	+			0.0001*** (0.0000)
Type I Error (percent)		26.52%	26.09%	15.22%
Type II Error (percent)		40.58%	42.41%	47.24%
χ^2		107.22***	108.30***	98.20***
Akaike Information Criterion		0.9499	0.9525	0.9617
McFadden R ²		0.0951	0.0960	0.0871

Robust standard errors are in parentheses. * denotes significance on the 10 percent, ** on the 5 percent and *** on the 1 percent level.

Source: IMF WP 07/275.

Nonparametric Tests: CAR vs. NPL/total gross loans



Crisis observations would be expected in the northwest region. Combining the two variables can help in minimizing the Type I/II errors.

“Benchmarking”: Conclusions

- Preliminary evidence that FSIs have some benefits for the identification of banking problems:
 - descriptive statistics and plots for crisis/non-crisis cases
 - logit and duration regressions
 - nonparametric estimates
- Estimates are somewhat encouraging, but aggregate FSIs seem only a very rough tool.
 - In fairness, predictive accuracy is a general weakness of EWS models, and more generally of predictive macroeconomic models (“we are all monitorists”).

Why Are We Finding This?

- FSIs are based on regulatory data.
 - “Smoothing” may be going on. For example, regulatory capital differs from the underlying economic capital. NPLs-provisions is only a proxy for the real economic value of the loans.
 - Some of the cross-country variability may be due to methodological differences.
- Only aggregated data –there is differentiation by peer groups during crises that is not visible in the aggregates.
- Low frequency (cross-country FSIs are only annual)

Accounting-Based and Market-Based Indicators

Accounting-based	Market-based
CAMELS data	Relative stock prices
Most FSIs	Distance to default
Z-scores	Credit default swaps
Basic stress tests	Spreads in IB market
...	FIRST/END etc.
	...
Ratings?	Ratings?

Example: Z-score

- Measures individual bank risk; became a popular measure of bank soundness (e.g., Boyd and Runkle (1993), Hesse and Cihak (2006))
 - Directly related to the probability of insolvency.
 - $z \equiv (k + \mu) / \sigma$, where
 - k is equity capital as percent of assets,
 - μ is average after-tax return as percent on assets, and
 - σ is std. dev. of after-tax ROA, as a proxy for return volatility.
 - Higher z-score = lower probability of insolvency.
 - Measures # of std deviations a return realization has to fall in order to deplete equity, assuming normality of banks' returns.
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Example: Distance to Default

- Similar concept to Z-score, but using market data.

$$DD_t = \frac{\ln(V_{A,t} / D_t) + (\mu - \frac{1}{2}\sigma_A^2)T}{\sigma_A \sqrt{T}}$$

- Sum of ratio of estimated current value of assets to debt and return on market value of assets, divided by volatility of assets.
 - Market value and volatility of assets typically estimated by Black and Scholes (1973) and Merton (1974) options pricing model, using mkt data on equity and annual accounting data.
 - Higher DD indicates an improvement in financial soundness, although the measure is sensitive to underlying assumptions.
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Accounting-Based and Market-Based Indicators

	Accounting-based	Market-based
+	Commonly known Easier to interpret Independent on quality of market	Shorter lags Higher frequency "Markets' view"
-	Longer lags Lower frequency Misreporting?	Require liquid and transparent markets Sensitive to assumptions?

Core Concept: Default Probability

Expected asset level and asset volatility are the drivers of expected losses and probability of default

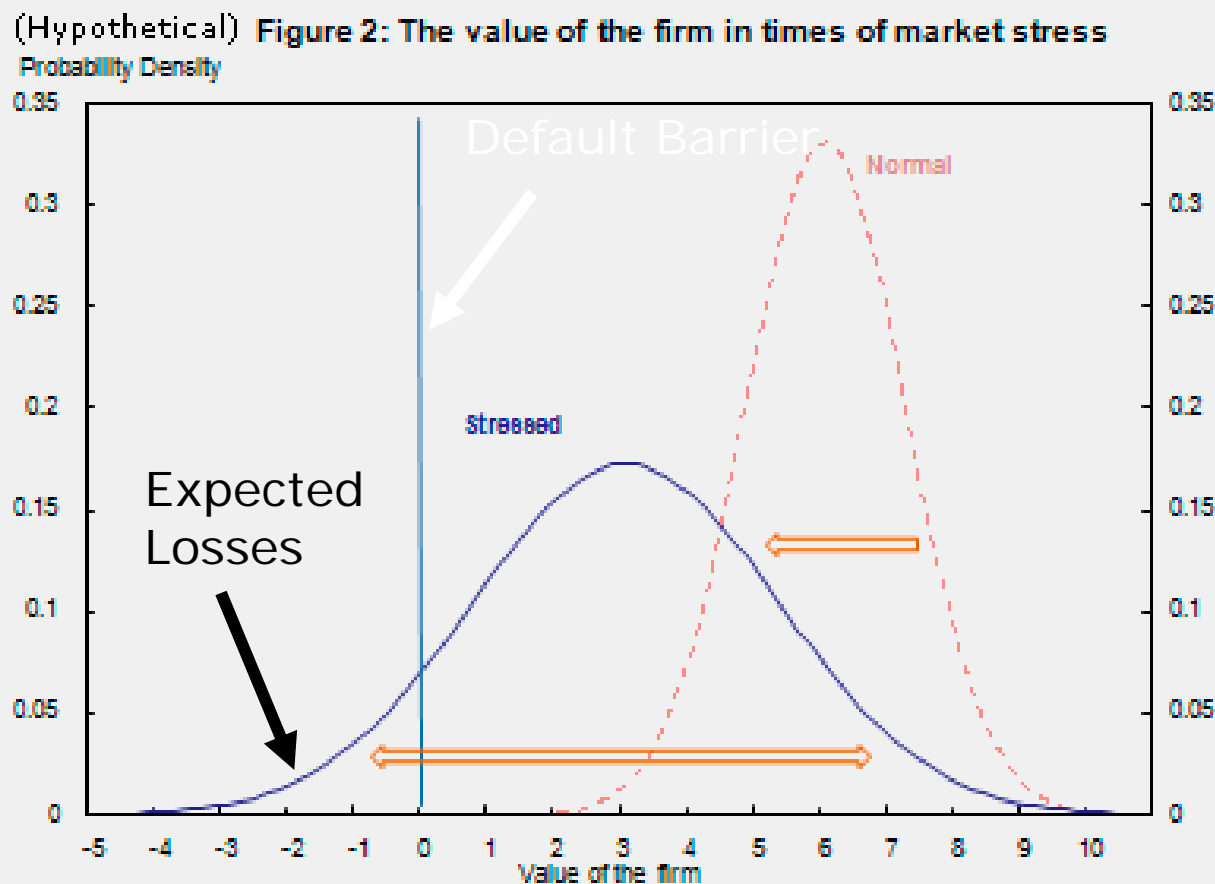
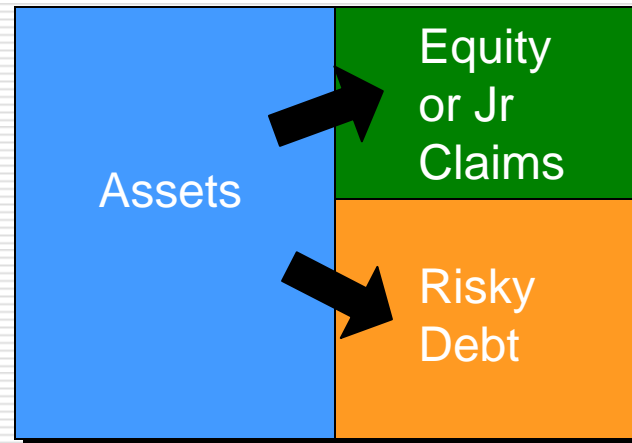


Chart courtesy of Dale Gray (IMF).

Core Concept: Merton Model



- Value of liabilities derived from value of assets.
- Liabilities have different seniority.
- Randomness in asset value.

$$\begin{aligned} \text{Assets} &= \text{Equity} + \text{Risky Debt} \\ &= \text{Equity} + \text{Default-Free Debt} - \text{Expected Loss} \\ &= \text{Implicit Call Option} + \text{Default-Free Debt} - \text{Implicit Put Option} \end{aligned}$$

Chart courtesy of Dale Gray (IMF).

Tail-Risk Models for Individual Institutions

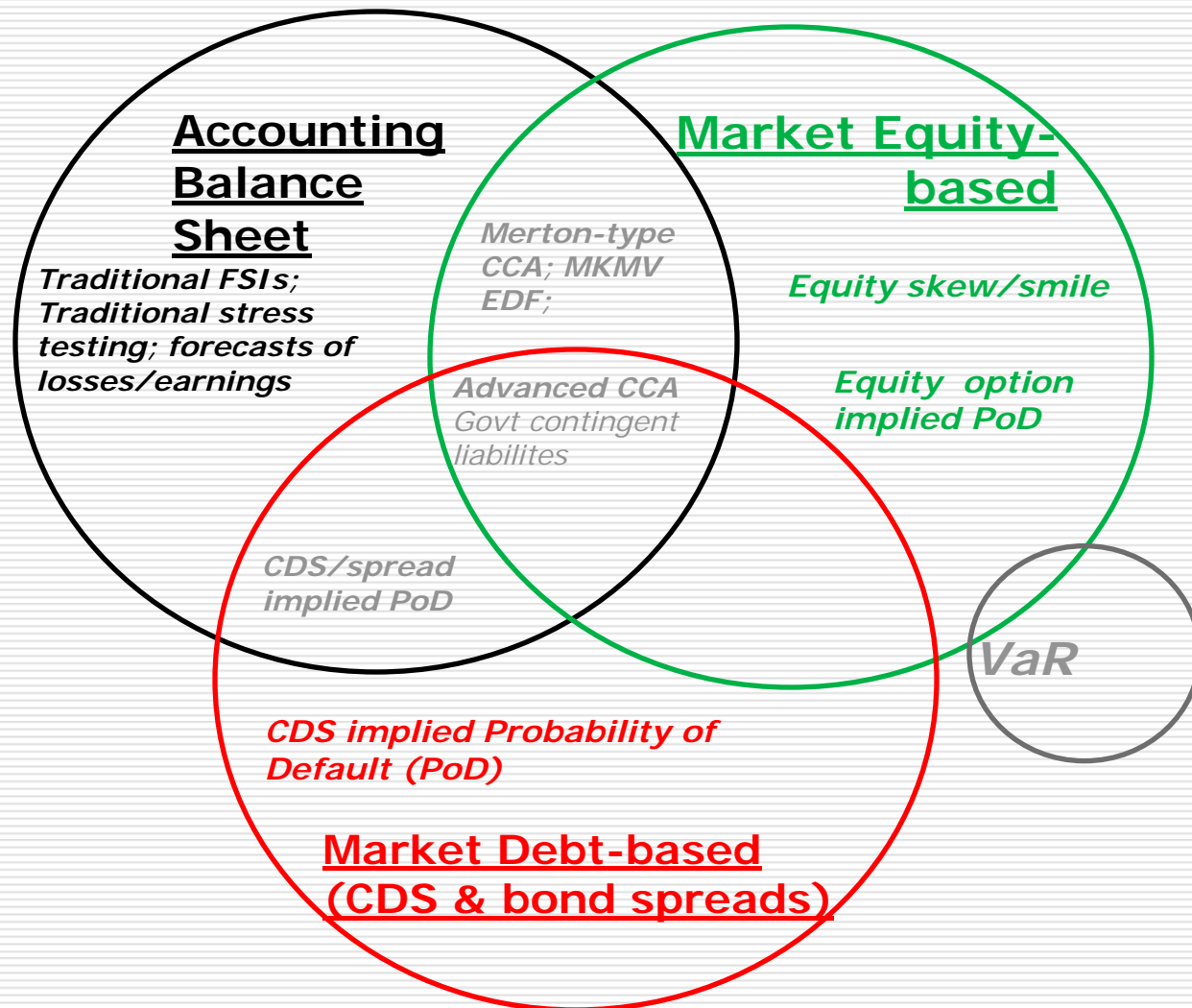


Chart courtesy of Dale Gray (IMF).

Systemic Tail-Risk Models

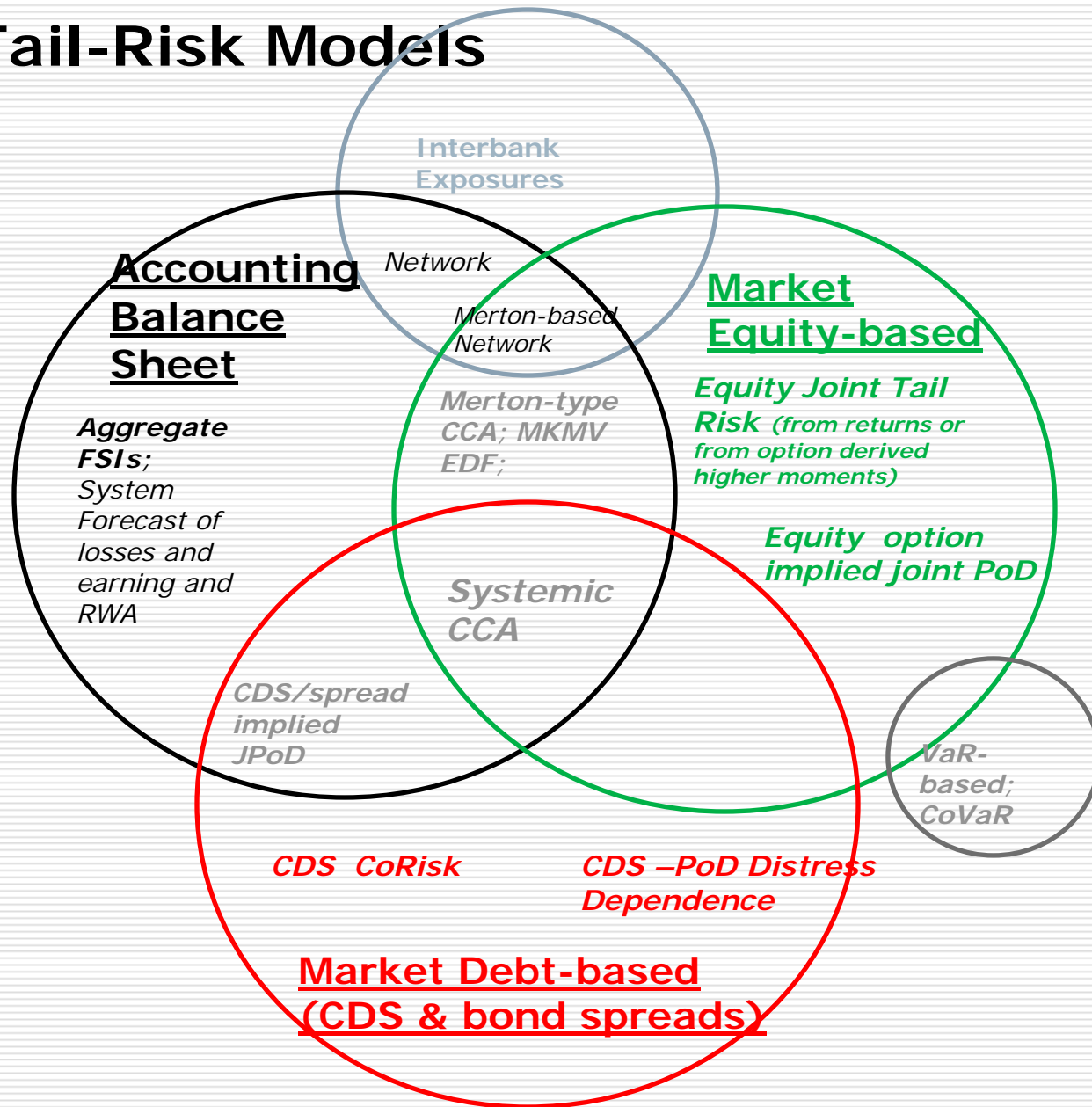


Chart courtesy of Dale Gray (IMF).

Where Does This Leave Us?

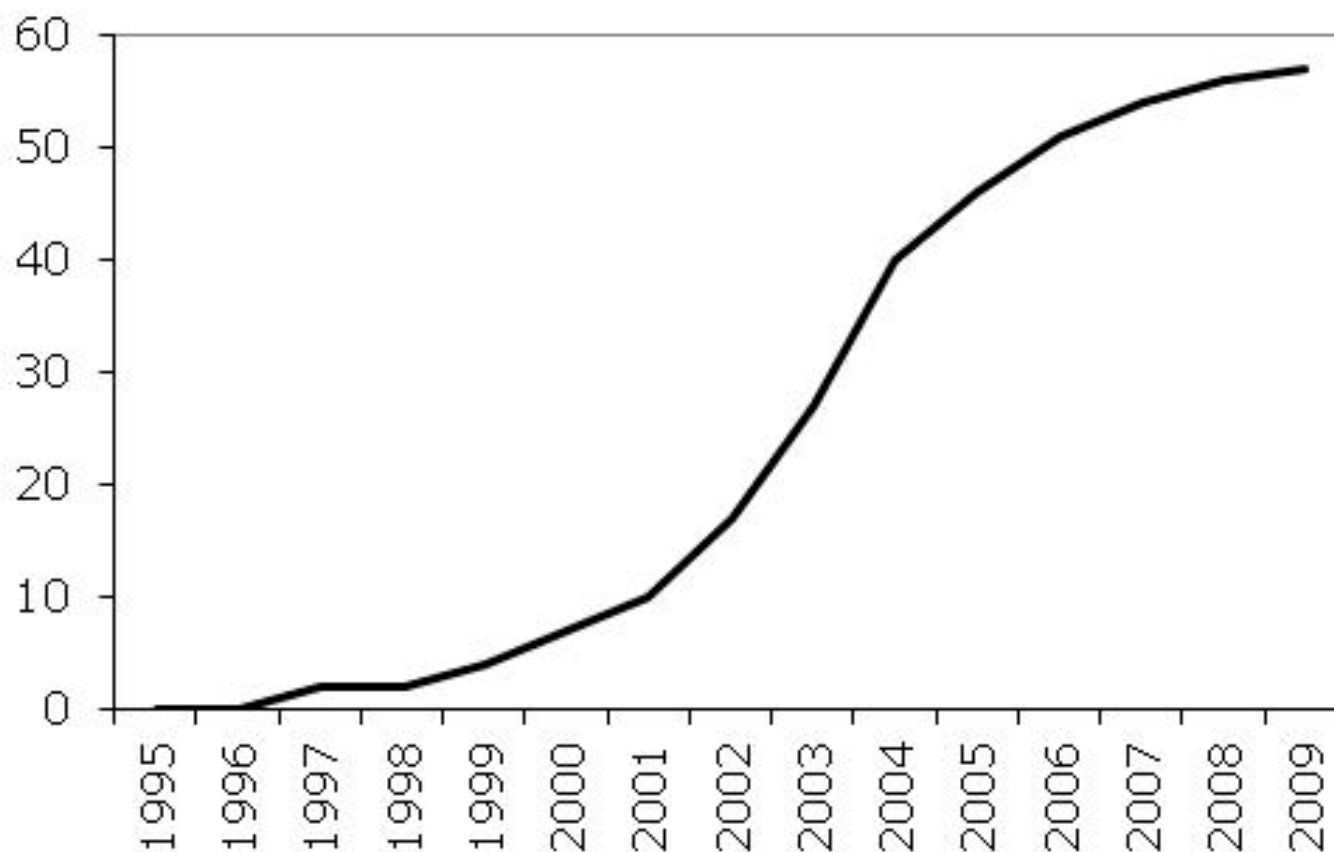
- Initiatives on FSI compilation are useful for a top-down macro-financial international comparability exercise
 - However, FSIs need to be interpreted with caution
 - Limited predictive power (backward looking)
 - Lagging; low frequency
 - Complemented by other indicators, tools, and methods
 - Qualitative assessments (risk management, supervision)
 - High-frequency market-based indicators
 - Bottom-up stress tests (of individual institutions)
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Part II

Writing a Good Financial Stability Report

The Number of Countries Publishing FSRs



- Note: In some countries (e.g., Iceland, Norway, UK), FSRs are published both by the central bank and by the supervisory authority (“Financial Risk Outlook”).

Work Done in IMF

- GFSRs
 - Reviews of country FSRs
 - Technical cooperation/capacity building
 - Summaries of FSR assessments
 - M. Čihák, 2006, "How Do CBs Write on Financial Stability?" IMF WP 06/163
 - www.imf.org/external/pubs/ft/wp/2006/wp06163.pdf
 - Forthcoming: an update (lessons from crisis)
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Main Themes

- FSRs are useful, but much more should be done, e.g.:
 - clarify the definition of financial stability and the aims of the FSR, increase coverage of topics, consistency across time and comparability across countries
 - provide underlying data
 - Not clear whether FSRs really provide early warning.
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Issues to Be Addressed by a Central Bank Publishing an FSR

- Define the project's aim (e.g., improving analytical capability, communication).
 - Decide whether to make it internal or public.
 - Decide on coverage.
 - Decide on presentation and publication.
 - Project management, resources.
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Issues to Be Addressed by a Central Bank Publishing an FSR

- ❑ The drafting team often relatively small (4-10 people)
 - ❑ Where is the “financial stability unit” located?
 - research (e.g., Czech Republic)
 - research and statistics (Croatia)
 - bank supervision (Germany)
 - a wider financial stability department that includes also other topics, such as payments system (Norway, Sweden)
 - ❑ No arrangement is clearly superior
 - ❑ How well it works depends on
 - resources and skills available (quantitative skills, well-grounded in macroeconomics, but also in banking)
 - ability to share data, models, other information
 - ❑ Internally: statistics, monetary policy, supervision, research.
 - ❑ Externally: financial supervision authority or ministry of finance, statistics office, academics.
 - ability of the drafters to form and maintain frank assessment
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How to Assess FSRs?

- Inspiration: “How Do CBs Write?”
 - CEPR study of 19 inflation reports
 - Criteria: clarity, consistency, coverage of key issues (policy objectives, decision-making, analytical framework, input data, presentation of forecasts, evaluation of past forecast and policy)
 - Finds positive link between report quality and policy predictability.
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How to Assess FSRs?

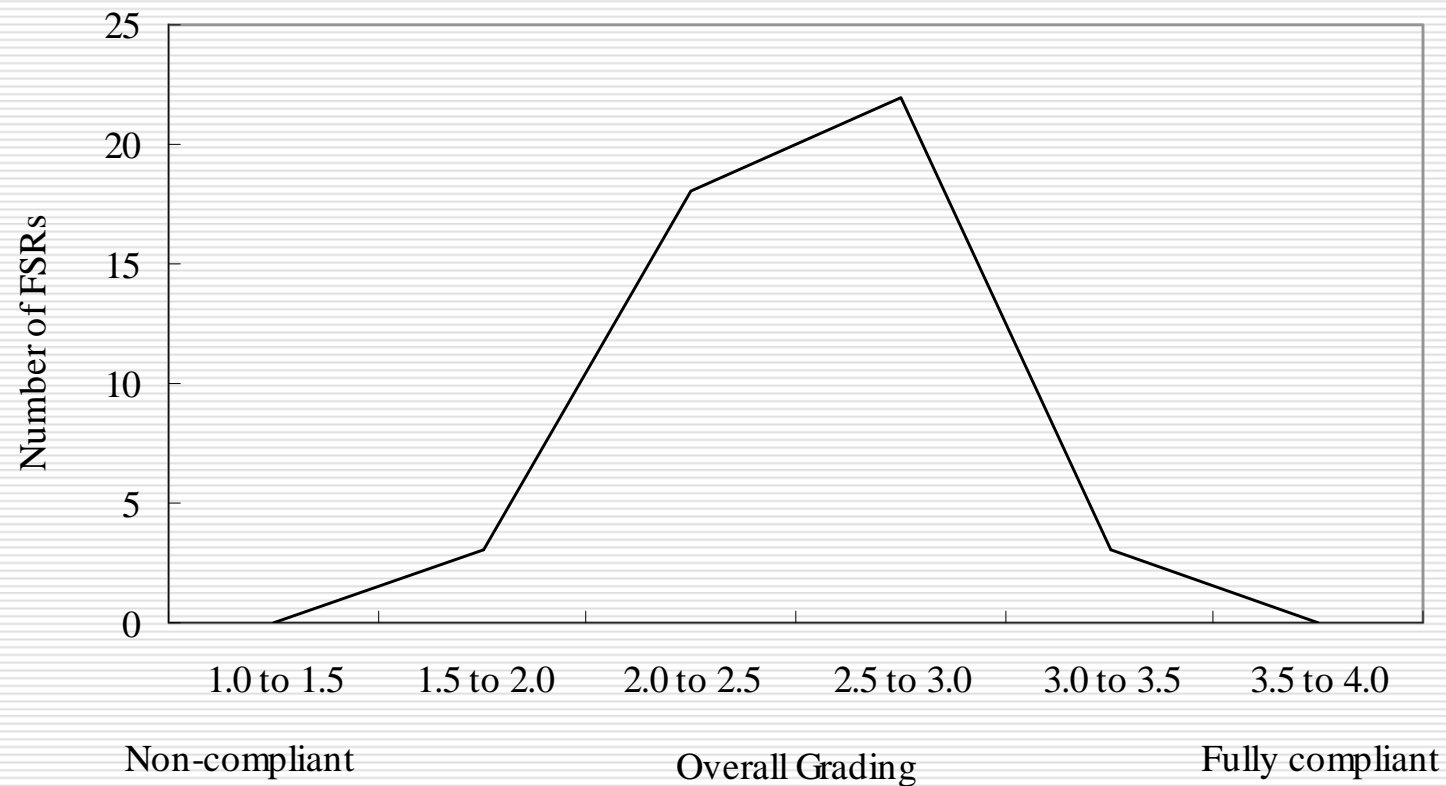
- Challenges in assessing FSRs:
 - FSRs are usually more backward-looking
 - monitoring outcomes is more complex
 - more difficult to map words into policies (vs. “say what you do – do what you say” in IT)
 - responsibility for outcomes is less clear
 - market reports on FS have been more limited
 - Nonetheless, possible to assess clarity, coverage, and consistency of FSRs – **CCC framework** (next slide).
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	Clarity	Coverage	Consistency
Aims	<ul style="list-style-type: none"> • Are the aims of the report clearly defined? • Does the report use a clear definition of financial stability? 	<ul style="list-style-type: none"> • Does the report cover appropriate aims? • Does the definition of stability cover both the absence of crises and resilience to crises? 	<ul style="list-style-type: none"> • Are the aims presented consistently across reports? • Is the definition of financial stability presented consistently across reports?
Assess-ments	<ul style="list-style-type: none"> • Is the overall assessment clearly presented? 	<ul style="list-style-type: none"> • Does the overall assessment cover the key topics? 	<ul style="list-style-type: none"> • Are the overall assessments consistent across time?
Issues	<ul style="list-style-type: none"> • Are the main stability issues clearly identified? 	<ul style="list-style-type: none"> • Is the coverage of the issues comprehensive? 	<ul style="list-style-type: none"> • Is the coverage of issues consistent across the reports?
Tools	<ul style="list-style-type: none"> • Is it clear what tools are used to derive the results? What are the underlying assumptions? What are the data used? Are the results presented in a succinct way? 	<ul style="list-style-type: none"> • Does the report use available tools? 	<ul style="list-style-type: none"> • Are the tools used in a consistent way across the reports? Are results presented in a consistent way that allows comparisons?
Structure and other features	<ul style="list-style-type: none"> • Is the structure of the report easy to follow? • Are other features of the report—such as its length, frequency, timing, or public availability—designed in a way that supports its clarity? 	<ul style="list-style-type: none"> • Does the structure of the report allow covering the key topics? • Are other features of the report designed in a way that supports its coverage? 	<ul style="list-style-type: none"> • Is the structure of the report consistent across time to make it easier to follow for repeat users? • Are other features of the report designed in a way that supports its consistency?

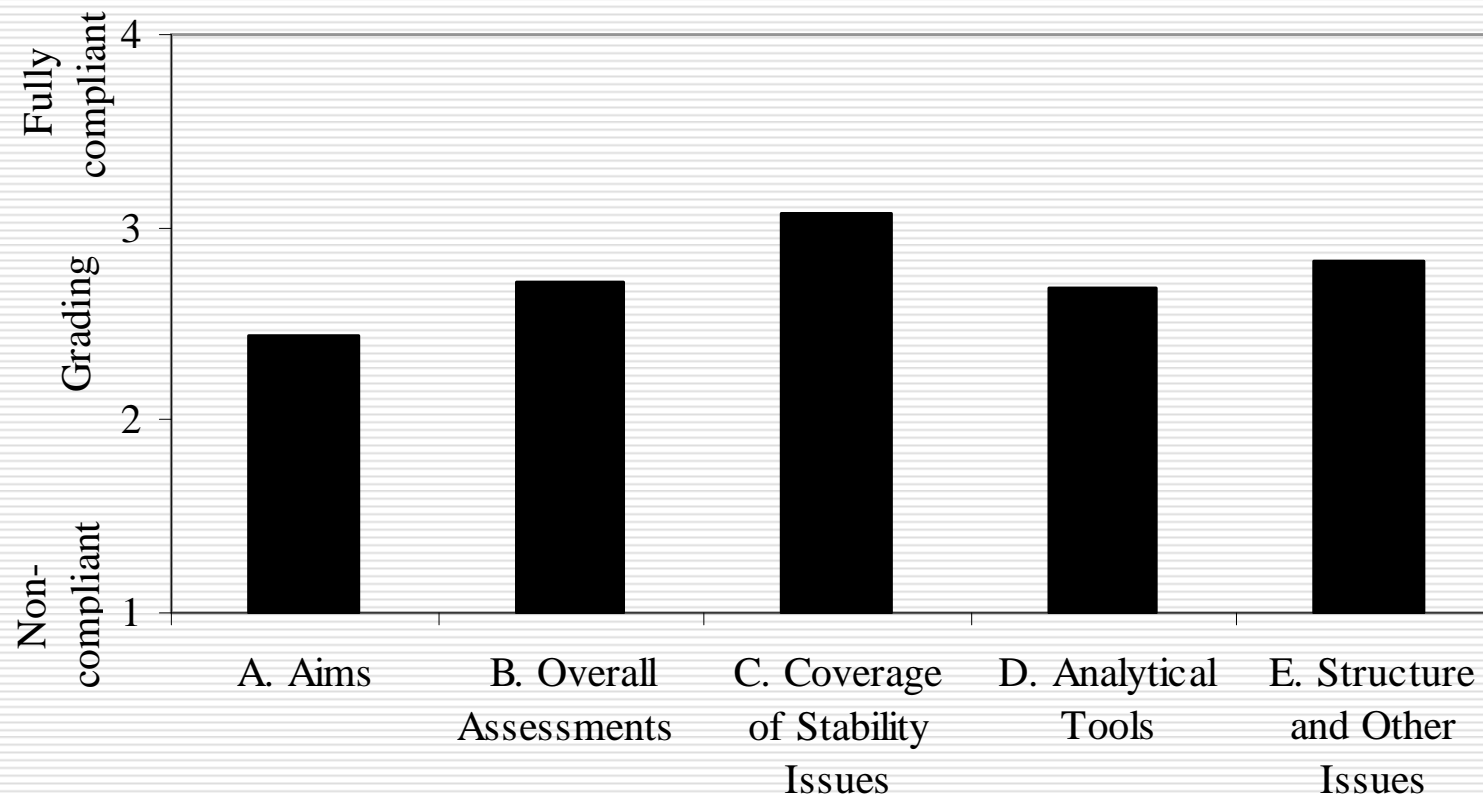
A Survey of FSRs

- ❑ A survey of the available FSRs was conducted, using the above criteria.
 - ❑ Altogether, more than 200 FSRs published in 59 countries in more than 15 years were analyzed (more than 15,000 pages of text).
 - ❑ All principles graded on a scale from 1 (non-compliant) to 4 (fully compliant).
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Summary of the FSR Survey

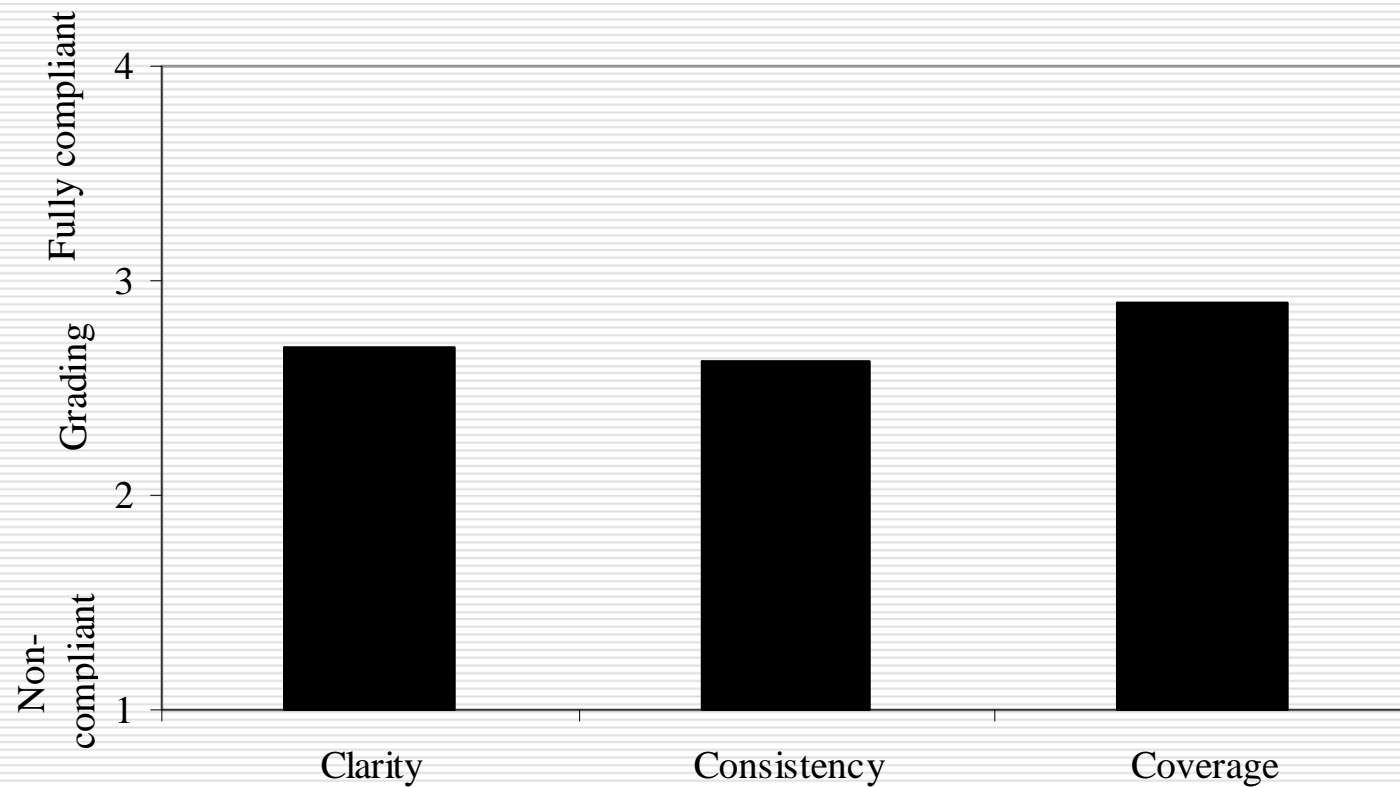


Summary of the FSR Survey



Note: Average over the most recent FSRs (issued in 2009).

Summary of the FSR Survey



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Frequent Areas for Improvement

- Provide a more standardized “core”
 - Be more explicit about aims
 - Provide operational definition of FS
 - Provide tables with underlying data
 - Provide more discussion of exposures.
 - Include more calculations on disaggregated data.
 - Present stress test results over time.
-

Coverage of Issues in FSRs

- Coverage of non-bank financial institutions is (appropriately) growing
 - Sensitive issue, e.g. when the issuer is responsible for supervising banks, but not other financial institutions
 - Increased attention to non-financial sectors as potential sources of risk.
 - Many FSRs also include sections dealing with payment system stability.
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FSR Structure: Recent Trends

- Differentiation of “core” and special issues
 - The latter may take up a bigger part - e.g. 2/3 in the French FSR
 - Allows for more variety, while maintaining consistency of presentation in the “core.”
 - Can facilitate contributions from outside experts
 - Risk of diluting the main message?
 - Risk of variable quality (small CBs)
 - Statistical appendix or spreadsheet with underlying data
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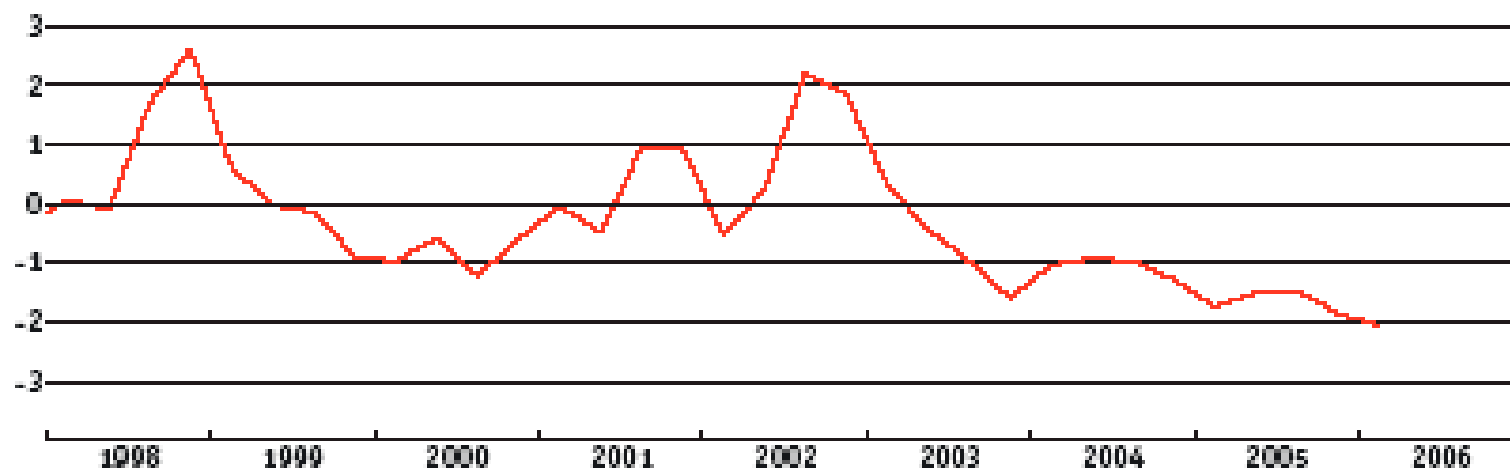
Trends in Tools Used

- ❑ More use of market-based indicators
 - ❑ More use of stress testing, early warning systems, other calculations based on disaggregated data.
 - ❑ Attempts to integrate better with other efforts (e.g., monetary policy studies and models)
 - ❑ More analysis of policy framework
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“Stress Indicator” (Switzerland)

Stress index*

In standard deviations



Source: Swiss National Bank's 2006 FSR.

“Stress Indicator” (Switzerland)

Components (“symptoms of stress”):

- fall in banks’ stock price index
- increase in banks’ bond yield spread
- fall in interbank deposits
- decrease in banks’ profitability
- decrease in banks’ capital
- increase in banks’ provisioning rate
- share of total assets held by banks listed on the regulator’s watchlist
- decrease in the number of banks’ branches

Matrix Presentation (Bank of England)

Vulnerability	Probability	Impact
Low risk premia		
Global imbalances		
Global corporate debt		
UK household debt		
LCFI stress		
Infrastructure disruption		

Scale: Signif. increase/slight increase/broadly unchanged/slight decrease/signif. decrease

Source: Bank of England's 2006/06 FSR.

Overall Assessments: Was There a Positive Bias?

- ❑ Most overall assessments in recent FSRs are positive: almost all (96 percent) of the FSRs surveyed have characterized the financial system as being, e.g., “in good shape,” “solid,” or at least “improving”.
 - ❑ When problems recognized, it is often retroactively.
 - ❑ Possible explanations
 - *As good as it gets?* The global financial system has been relatively stable in recent years.
 - *Selection bias?* Countries deciding to publish FSRs have in place robust financial systems.
 - *Presentation bias?* CBs worry about impact of FSRs on stability, and on their reputation.
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Overall Assessments: Is There a Presentation Bias?

- ❑ CBs prefer to present the system positively
 - 👍 highlighting risks early can help to mitigate ...
 - 👎 ... but concerns about public's reaction
 - ❑ This bias is bigger if involved in supervision.
 - 👍 analysis requires good data, typically available to supervisors
 - 👎 conflict of interest, results can be read as critique
 - ❑ What do to?
 - 👍 FSR authors should have access to data, but be sufficiently separate from supervision
 - 👍 role for independent assessments (markets, IMF)
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2007-09: “Stress Testing” FSRs

- Many FSRs warned of risks from U.S.
 - But cast more in terms of global imbalances rather than issues in U.S. mortgage markets
 - Impact on behavior?
 - Major financial institutions had substantial exposures to the U.S. market
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Priorities for FS Work

- “Best practice” in FSR toolkit
 - sectoral approach
 - toolbox of static and dynamic techniques
- Priorities for deepening FS work
 - highlighting key structural vulnerabilities
 - developing fully articulated risk scenarios
 - exploring regional spillover risks more fully.
- Aims for medium-term:
 - developing more forward-looking stress test scenarios
 - making more data available
 - completing next generation DSGE models w fin sector
 - comparing policy scenarios (cumulative output costs)

This part benefitted from useful discussions with Valerie Herzberg (IMF).

Priorities for FS Work

- Broader challenge
 - Bridging “culture gap” between financial analysts and macroeconomists.
 - Can help spotlight where “tail risks” have become more plausible.
 - More focus on understanding systemic ramifications of financial innovation
 - Analysis should typically start at the micro level, but needs then to be broadened to a macro perspective.
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FSRs: Ultimate Challenge

- Make FSRs more effective (impact on behavior)
 - Possible ways forward:
 - Present medium-term scenarios that articulate risks and linkages that actors may not have internalized.
 - Explore quantitatively potential costs of a crisis, versus “insurance” costs of a pre-emptive strategy
 - Target specific products to key audiences, including committees of fiscal, monetary and regulatory officials (EU seems moving in this direction).
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Financial Soundness Indicators Financial Stability Reports

Thank you!