Is early warning against systemic risk feasible? The ECB’s newly developed analytical support to the European Systemic Risk Board

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“Economics on the Move”

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Any opinions expressed are only the presenter’s own and should not be regarded as opinions of the European Central Bank or the Eurosystem.
Introduction

• Since the Lehman collapse in September 2008
  - World went through the largest recession since the 1930s
  - Fiscal deficits increased in all countries
  - Sovereign debt crisis in Europe
  - Financial markets talk about redomination risk in the euro area

• These events were a direct consequence of the financial crisis and they provide a clear motivation for a continuous efforts to improve frameworks for financial stability analysis and policy
Outline

1. Institutional set up, definitions and the process regarding systemic risk identification

2. Some indicators of systemic risk and early warning models used in the ECB’s financial stability analysis

3. Is “early warning” against systemic risks feasible? The example of 2007

4. Do we need an interdisciplinary approach?
   a) political economy: the fundamental issues regarding the long-term viability of EMU
   b) science of uncertainty: the process of risk identification

5. Conclusions
The new EU supervisory architecture

**Micro-prudential supervision**

- European System of Financial Supervision
  - Proposed: ECB (with national supervisors)
- European Insurance and Occupational Pensions Authority
- European Securities and Markets Authority
- European Banking Authority

  - Ensure EU-wide technical supervisory standards
  - Coordination of supervisors (also in crises)

**Macro-prudential oversight**

- European Systemic Risk Board
  - ECB
  - National central banks
  - European Supervisory Authorities
  - European Commission

  - Issue risk warnings and, if necessary,
  - Macro-prudential recommendations
“**Financial stability** can be defined as a condition in which the **financial system** – comprising of financial intermediaries, markets and market infrastructures – is capable of withstanding shocks and the unavelling of financial imbalances, thereby mitigating the likelihood of disruptions in the financial intermediation process which are severe enough to significantly impair the allocation of savings to profitable investment opportunities.” (ECB, Financial Stability Review, preface)

**Systemic risk:**

The risk that financial instability becomes so widespread that it impairs the functioning of a financial system to the point where economic growth and welfare suffer materially.
Economics of systemic risk

**Time series dimension of systemic risk** ...
- Short-run buildup may occur when measured risk is low
  - buildup may be linked to financial sector growth, underwriting standards, degree of monitoring, risk management of market participants

=> Challenge to build forward looking measures (**Early Warning Models**).

**...versus cross sectional dimension of systemic risk:**
- Interlinkages may enable risk sharing but also cause risk propagation
  - **Fire sale externality**: deleveraging spills across institutions due to market illiquidity.
  - **Hoard**ing **externality**: institutions hoard lending capacity.
  - **Runs**: e.g. on the shadow banking system
  - **Network externality**: counterparty credit risk

=> **Systemic Risk indicators**
Focus on: Macroprudential oversight process

Potential sources of systemic risk

Risk identification

Detection of vulnerabilities, potential triggers, likelihood of risks materialising

Selected tools:
- Set of financial stability indicators and early warning models
- Market intelligence
- Expert judgement

Risk assessment

Assessment of propagation channels, potential severity of risks identified and system’s ability to absorb shocks

Selected tools:
- Assessing propagation channels (including contagion and spillover models)
- Macro stress-testing

Communication

Yes
Vulnerability

Financial Stability Reports
ESRB Risk warnings

No

Yes
Material risk

Policy response

Possible macro-prudential policy action by responsible authorities (not ECB)

Price stability at risk in the long run? Possible monetary policy response (l-a-w)

Feedback to risk monitoring and analysis

Monitoring follow-up of recommendations and assessing policy impact
Six Origins of vulnerabilities: Aim to find robust early warning models and systemic risk indicators and implement Early Warning System

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Indicators of financial stress
(Probability of a simultaneous default of two or more large EA banks)

(Oct. 2008 – 10 Sep 2012; probability in percentages)

Sources: Thomson Reuters and ECB calculations
Indicators of financial stress
(Composite indicator of systemic stress (CISS) for the euro area)

(Jan. 1999 – Aug. 2012)

Sources: ECB and ECB calculations.
Market segments and indicators of CISS

**Equity market (non-financials):** realised volatility of equity returns; CMAX; stock/bond correlation

**Money market:** realised volatility of 3 month Euribor; spread Euribor/T-bill (3 month maturity); recourse to the marginal lending facility at the ECB.

**Bond Market:** realised volatility of 10y bund; spread corporate AAA versus government bonds; 10y interest rate swap spread.

**Financial intermediaries:** realised volatility of excess returns of the banking index; spread A rated financials/non-financials; CMAX interacted with book-price ratio for the financial sector equity index.

**Foreign exchange:** realised volatility of US/EUR, JPY/EUR, GBP/EUR.
Degree of interconnectedness of banks
(Centrality of Eurosystem banks based on their cross-holding of securities)

(Oct. 2008 – Aug. 2012; average of normalised number of weighted shortest paths)

Source: ECB.

Notes: A decrease denotes a general fall of the centrality of banks in the system, and therefore a more resilient banking system as a whole.
Evolution of tail dependence network for European banks

Evolution of tail dependence network for European banks, when conditioning with sovereign yields

Tail dependence network: Focus on Spain 2007-2010

Tail dependence network: Focus on Spain 2010-2012

European Bank Early Warning System (EB-EWS)

(Betz, Oprica, Peltonen, Sarlin (2012): “Predicting Bank Distress and Identifying Interdependencies among European Banks”), ECB, mimeo.

Purpose:

1. Predict individual bank distress in the EU
2. Identify potential for contagion
3. Understand determinants of banking sector fragility in Europe

Key Features:

Estimation sample: 439 EU banks with at least EUR 1 bln in assets
Model calibrated for out-of-sample prediction of bank distress 2 years ahead
EB-EWS – case studies: predicted crisis probabilities for Dexia and Bank of Ireland from 2007Q1-2011Q4

Dexia SA

Bank of Ireland
EB-EWS: identifying banks potential for contagion given and early warning signal
EB-EWS: current distress probabilities for European GSIFIs (and contributing factors)
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Challenges – risk surveillance: Interpretation of indicators varies with circumstances

- **Many indicators of vulnerabilities have two interpretations:**
  - **High bank solvency:** improved shock absorption capacity or foregone lending opportunities?
  - **Narrow spreads:** risks are low or mispriced?
  - **High loan to deposit ratios:** efficient banking sector or funding vulnerability?
  - **Cross border market integration:** risk sharing or contagion channel?
  - **High return on equity:** profitable business model or excessive risk taking and leverage?
Is Early Warning Feasible?

• Majority of academics very critical: out-of-sample failure (!) (in sample overfitting, variable selection bias), reduced-form exercise (fundamental trend vs. growing imbalances?)

• Majority of policy makers (at least until crisis) dominated by fear of type II errors (false alarms)

• Goodhart’s Law: “Any observed statistical regularity will tend to collapse once pressure is placed upon it for control purposes.”
Is Early Warning Feasible? Some careful optimism...

- Preference shift from type I to type II errors might be significant due to depth of crisis (more balanced preferences increase usefulness, see Alessi/Detken, 2009)

- Easier to predict imbalances than crises (IMF/FSB EWE, ECB surveillance process)

- Application of (under explored) suitable methodologies, e.g. Classification and Regression Trees (simple but robust, conditional rules of thumb, Manasse/Roubini, 2008; also Ghosh and Ghosh, 2003)

- Data availability (housing prices; large data sets; FoF, cross-country exposures, individual bank balance sheet data)

- Important issues like out-of-sample validation, overfitting risk can be dealt with
Systemic risk surveillance - can we predict the financial cycle?

Some indicators did (would have) predict(ed) the last financial cycle!

In terms of performance there are three types of indicators:

1. Early Warning Models with structural indicators e.g. global credit gap: would have predicted financial crisis like many other past crises (caveat: also significant number of false alarms)
2. Structural indicators not (yet) subject to early warning evaluation (mainly due to lack of time series) e.g. leverage, house price valuation models: would have predicted crisis with hindsight – difficult to decide on threshold value – how much is too much? (typical question: financial development and catching up versus growing imbalances?)
3. Market based indicators e.g. based on price volatilities: not useful as early warning. These are thermometers not barometers.
Early Warning Indicators: A “global” credit gap

- Some early warning indicators currently used by the ECB identified growing imbalances before the crisis.

- Global credit gap rising from 2002 onwards and above threshold Q3 2005 - Q2 2009.

- Real time performance since 1970: 82% correct warnings, 32% false alarms. 95% of costly asset price booms predicted in at least one of 6 preceding quarters.

Rising leverage and unstable funding

Banks leveraging up and more reliant on wholesale funding before the financial crisis

Leverage ratio for euro area and UK banks
(Jan. 2003 – Dec. 2011; total assets/capital and reserves)

Loan to deposit ratios for euro area and UK banks
(Jan. 1999 – Dec. 2011; percentages)

Source: ECB (MFI balance sheet items).
Increasing interconnectedness of banks

- Higher debt levels within the financial sector were accompanied by increased interbank lending and cross-holdings of debt securities among banks

- The banking sector had become more interconnected

Euro area monetary financial institutions’ (MFIs) lending to other MFIs and holdings of MFI debt securities (Q1 1999 – Q3 2011; percentage of GDP)

Source: ECB (MFI balance sheet items).
Asset price “disequilibria”

- Euro area residential property prices increased sharply in many countries before the crisis

- Developments were very disperse across countries

Sources: ECB and Bloomberg.
Examples of asset price “disequilibria”

- Commercial property markets in several euro area countries showed clear signs of overvaluation in 2007, when comparing with fundamentals.

Value misalignment indicators for prime commercial property in selected euro area countries (Q1 2007; percentage deviation from average values from Q1 1997 to Q1 2007)

Source: Jones Lange LaSalle, ECB and ECB calculations.
Note: For detail see Box 6 in the December 2011 ECB Financial Stability Review.
- Financial market stress and risk aversion indicators were at historically low levels before the outbreak of the financial crisis

- Probability of a simultaneous default of two or more large euro area banks very low

**Market price based indicator (1)**

Probability of a simultaneous default of two or more large euro area banks within two years (Jan. 2007 – Mar. 2012; probability; percentages)

Source: Bloomberg and ECB calculations.
Notes: For further details of the indicator, see Box 16 in ECB, Financial Stability Review, December 2007.
- Composite financial market stress indicator had been more or less flat from 1999 until August 2007.

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The three most fundamental issues regarding the long-term viability of EMU

1. Deficit Bias (especially forceful in a monetary union); e.g. Detken, Gaspar, Winkler (2004), ECB WP No. 420.

*SGP => Six Pack + Two Pack + Fiscal Compact => Fiscal Union*


*Six Pack (MIP/EIP) + Compact for Growth and Jobs + European Semester + national structural reforms*

3. (Partial) failure of (micro and macro-) supervisory process => excessive risk taking in financial sector; e.g. Padoa Schioppa (1999).

*Single Supervisory Mechanism => Banking Union + ESRB + reg. reforms e.g. Basel III*
Many critical issues are being addressed …

… but challenges remain, including:

1. Giving up national sovereignty versus mutual insurance of liabilities: does an equilibrium exist?

2. Feasible pace of change fast enough to regain investor confidence?

=> Political sciences / political economy key
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Science of Uncertainty / Psychology

**Ludic Fallacy** *(Nassim Taleb, The Black Swan)*:

Studying chance in narrow model of games and dice and ignoring uncertainty about rules of the game in real life

**Halo effect / judgement heuristics** *(Daniel Kahneman, Thinking Fast and Slow)*

- Excessive weight of first impression
- System 1 dominating System 2

*(System 1 infers and invents cause and intentions, neglects ambiguity, focuses on existing evidence and ignores absent evidence: intuitive story wins)*
Do we need an interdisciplinary approach?

This is nearly a rhetoric question, as deficiencies of mainstream economics have become so evident. So the answer is **YES**

From a practitioneers perspective:

We need (even) more attention to

a) political economy / public choice issues. The main systemic risks materialising in the crisis could possibly have been contained with closer attention to polit-economic arguments in the design of the system (EMU). These issues are currently dealt with and corrected in a painful process.

b) the science of uncertainty / psychology in order to avoid fallacies in the systemic risk identification process (e.g. ludic fallacy, halo effect, judgement heuristics of system 1).
Conclusions

1. The current macro-prudential surveillance process requires the ECB to supply the ESRB with regular risk analysis. An Early Warning System is being established – work in progress.

2. Work on micro-prudential supervisory processes also has a bright future at the ECB - since yesterday.

3. A careful optimism that early warning against systemic risk is feasible in principle seems defendable, once best practices are adhered to, the improving data landscape and methodological progress (e.g. avoiding variable selection bias) and due to relatively simple key patterns of financial crises.

4. A “real life risk surveillance process” does benefit from interdisciplinary approaches. Behavioural patterns of “supervisors” and public choice logic in institutional design are key areas to focus on to mitigate and/or identify systemic risk.
Thank you for your attention!
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1. (Partial) failure of (micro- and macro-) supervisory processes allowed a build up of systemic risk in the financial sector. The new European supervisory architecture has potential to correct the relevant deficiencies.

2. Current progress with early warning systems suggests that “early warning” is feasible, by focusing on “best practices”, and on structural patterns rather than on market based indicators.