The potential impact of bank balance sheet situations on public finances

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OUTLINE

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- **Methodology: the European Commission banking model SYMBOL**
- **Data**
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Scope of the work

Which is the potential impact of a banking system faced with financial difficulties on the stability of government finances?

**Interconnections between BANKS' and GOVERNMENTS' balance sheets.**

Sovereign bonds used as collateral to obtain liquidity from ECB

Support to banks in case of financial troubles

(capital injections, liquidity interventions, asset relief and guarantees)

EU public interventions in the banking sector (in % of GDP)

Source: the EFC questionnaire (based on data from 31/12/2009) and updates up to 31/10/2010.
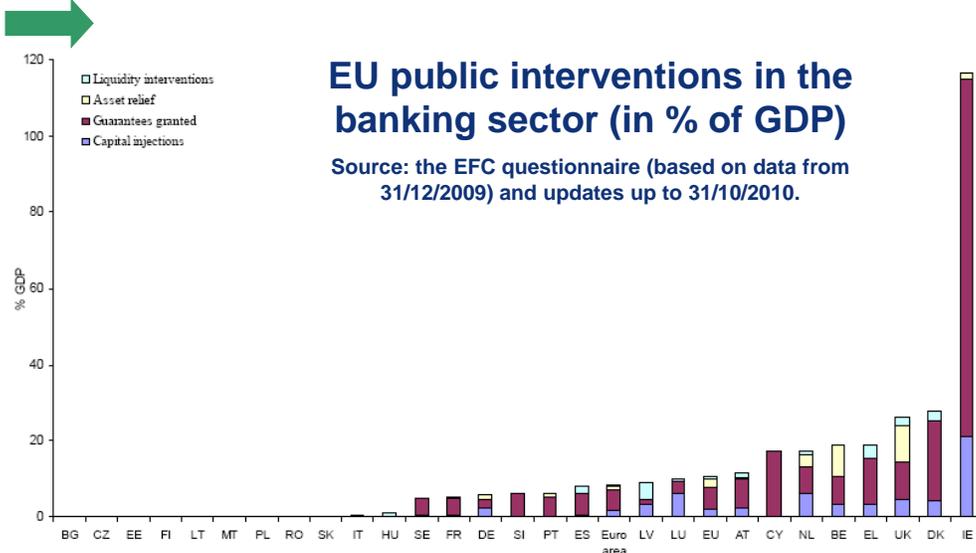
Methodology: the EC banking model SYMBOL

In cooperation with DG MARKT and experts of banking regulation the JRC has developed **SYMBOL**, a SYstemic Model of Banking Originated Losses

Bank 1   Bank n

Loss distribution of the banking system in case defaults
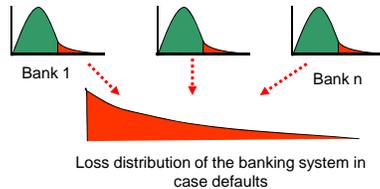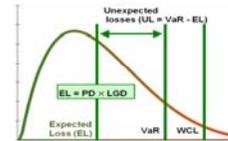
SYMBOL estimates the probability and magnitude of important economic losses and liquidity shortfalls occurring in the banking sector
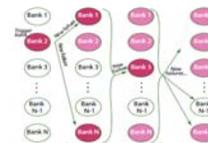
SYMBOL points of strength:

- it is coherent with the Basel framework
- it includes contagion due to interbank market
- It can be used to assess the impact of changes in banking regulation

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MICRO   Estimate the probability that losses in banks' portfolios cause bank defaults taking into account the amount of capital that banks hold to face their risk
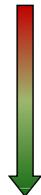
Derive the size of the losses due to bank defaults and estimate the distribution of losses of the overall banking system

MACRO   Estimate the impact of aggregate bank losses on government finances having considered the mitigation effect of the safety-net tools

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Steps of SYMBOL

1. Estimate the average probability of default of a bank portfolio by inverting the capital requirement formula used in Basel regulation

For each bank j an average probability of default $\overline{PD}_j$ of the loans portfolio can be derived such that

capital requirement ratio →

$$\frac{K_j}{\sum_i A_i} = \left\{ LGD \times N \left[\frac{\sqrt{R}N^{-1}(0.999) + N^{-1}\left(\overline{PD}_j\right)}{\sqrt{1-R}} \right] + - LGD \times \overline{PD}_j \right\} \times \text{Maturity Correction}$$

Loss Given Default   Normal distribution   Correlation   Inverse of Normal distribution

The capital requirement ratio is known and other variables are set to their values conventionally employed within the Basel framework

2. Simulate several economic scenarios. In each scenario check which bank fails. A bank fails if its loss is higher than the capital available

3. In case of failure, reduce the bank loss passed over to the system via the use of safety–net tools: Deposit Guarantee Schemes (DGS) and Resolution Funds (RF)

Bank is solvent   Bank is insolvent

Expected Loss   Basel VaR   Portfolio Losses

Provisions   Capital Requirements   Excess Capital   DGS/RF   Public Finances
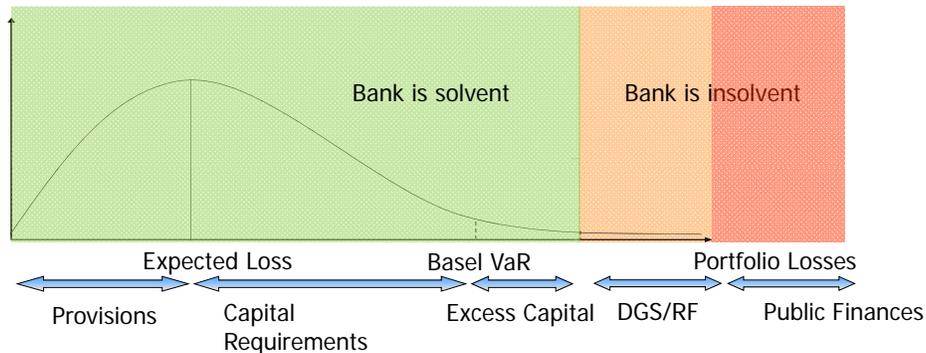
4. Simulate contagion between banks linked via the interbank market

Assumption
whenever a bank defaults, 40% of its interbank debits are passed as extra-losses to creditor banks
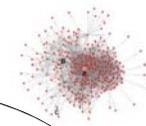
5. Derive the aggregate banking system distribution of losses. This is obtained by summing individual residual risks passed over to the system

Bank 1   Bank n

Loss distribution of the banking system in case defaults
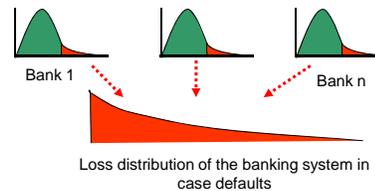
DATA

INDIVIDUAL BANKS' BALANCE SHEETS for 4 countries (Germany, Ireland, Portugal, Sweden) as of end 2009 derived by:

- Bankscope
- Supervisory authorities
- Central banks
- ECB

Description of the sample used for SYMBOL simulations

	Sample % Population	Total Assets (m€)	Total Liabilities (m€)	Total Interbank Debt (m€)	Total Interbank Credit (m€)	Total Covered Deposits (m€)	Total Capital (m€)
DE	64.19%	4 648 331	4 415 620	1 086 016	790 975	1 093 841	232 711
IE [1]	101.91%	1 221 181	1 155 789	276 738	148 729	147 145	65 392
PT	66.49%	323 762	297 421	43 561	34 505	82 952	26 342
SE	52.37%	455 355	422 301	97 604	122 872	75 383	33 054

(1) IE data used to construct the Sample % Population are derived both from ECB and from IE Central Bank

SYMBOL is used by the European Commission to evaluate the impact of new regulatory tools in banks' prudential regulation :

- Reinforced Deposit Guarantee Schemes (DG MARKT)

- Capital Requirement Directive IV – Basel III (DG MARKT)

- Introduction of bank Resolution Funds (DG MARKT)

- Introduction of an EU Tax on Financial Activities (DG TAXUD)

- Annual report Public Finances in EMU – 2011 (DG ECFIN)

SYMBOL estimates the amount of funds that should be injected in the banking system by public intervention

5 Simulated scenarios:

Scenario	Capital Setting			DGS/RF Setting		Bail in		Contagion	
	Basel 2	Basel 3 8%	Basel 3 10.50%	No	Yes	Yes	No	Yes	No
1	X			X			X	X	
2		X			X		X	X	
3		X			X		X		X
4		X			X	X			X
4a			X		X	X			X

Basel 3 8%: capital requirements = 8% of Risk Weighted Assets (RWA)

Basel 3 10.5%: conservation buffer, i.e. capital requirements up to 10.5% of RWA

DGS/RF: they can be set up or not

BAIL IN: Bondholders and non-covered depositors absorb part of the losses

CONTAGION: it can be considered or not

1: Beginning of the crisis

2: Current situation

3: RF eliminates contagion

4: Introduction of *Bail in*

4a: more capital (least risky scenario)

RESULTS: INDICATORS OF SUSTAINABILITY

I1: PROBABILITY THAT THE PUBLIC FINANCES ARE HIT BY LOSSES DERIVING FROM BANK DEFAULTS
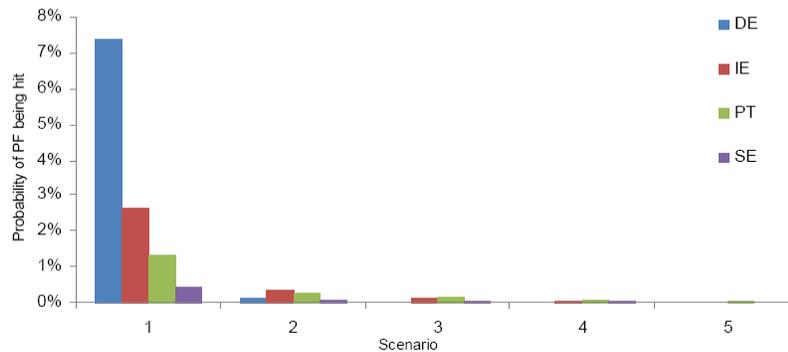
I2：SIZE OF LOSSES

Selected percentiles of the distribution of costs for public finances (% of 2009 GDP)

Scenario	DE					IE				
	1	2	3	4	4a	1	2	3	4	4a
90	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
95	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
97	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
99	0.02%	0.00%	0.00%	0.00%	0.00%	42.77%	0.00%	0.00%	0.00%	0.00%
99.25	0.03%	0.00%	0.00%	0.00%	0.00%	45.09%	0.00%	0.00%	0.00%	0.00%
99.5	0.06%	0.00%	0.00%	0.00%	0.00%	47.73%	0.00%	0.00%	0.00%	0.00%
99.75	0.13%	0.00%	0.00%	0.00%	0.00%	52.20%	3.38%	0.00%	0.00%	0.00%
99.9	13.55%	12.09%	0.00%	0.00%	0.00%	56.53%	40.98%	0.54%	0.00%	0.00%
99.925	14.97%	13.49%	0.00%	0.00%	0.00%	57.94%	43.25%	1.15%	0.00%	0.00%
99.95	16.36%	14.92%	0.00%	0.00%	0.00%	59.92%	46.30%	2.09%	0.00%	0.00%
99.975	17.90%	16.46%	0.00%	0.00%	0.00%	63.25%	50.60%	3.91%	0.05%	0.00%
99.99	19.50%	18.08%	0.12%	0.00%	0.00%	67.97%	55.45%	6.59%	1.02%	0.29%
99.995	20.76%	19.34%	0.74%	0.00%	0.00%	71.66%	59.22%	9.09%	1.93%	1.14%
99.999	24.05%	22.71%	2.81%	0.71%	0.76%	81.95%	69.24%	15.65%	4.31%	3.38%

Scenario	PT					SE				
	1	2	3	4	4a	1	2	3	4	4a
90	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
95	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
97	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
99	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
99.25	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
99.5	0.68%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
99.75	3.24%	0.59%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
99.9	8.55%	3.12%	0.59%	0.00%	0.00%	0.02%	0.00%	0.00%	0.00%	0.00%
99.925	9.95%	4.39%	1.06%	0.00%	0.00%	2.27%	1.41%	0.00%	0.00%	0.00%
99.95	11.56%	6.72%	1.76%	0.14%	0.00%	3.34%	2.48%	0.00%	0.00%	0.00%
99.975	13.83%	9.81%	3.03%	0.66%	0.03%	5.49%	4.64%	0.91%	0.00%	0.00%
99.99	16.66%	12.94%	4.86%	1.42%	0.72%	19.94%	19.08%	2.55%	0.52%	0.35%
99.995	19.06%	15.52%	6.44%	2.07%	1.32%	22.23%	21.37%	3.96%	1.08%	0.88%
99.999	24.95%	21.60%	10.51%	3.75%	2.93%	27.22%	26.36%	7.74%	2.61%	2.37%

CONCLUSIONS

- The EC is making use of the model SYMBOL to help (quantitatively) assessing the effect of changes in EU legislation

- In particular, SYMBOL has been used for the assessment of the riskiness of a country's government debt

- Using an integrated approach is fundamental and may optimize the effect of enhanced legislation

- SYMBOL will be further developed and improved (i.e. extension in geographical coverage, inclusion of the effect of sovereign risk, design of macroeconomic scenarios)

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