Regulatory Capital Charges for Too-Connected-To-Fail Institutions: A Practical Proposal

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Outline of the Presentation

- Systemic Risk Contribution = Incremental Contribution to Aggregate Social Losses
- Too Connected to Fail Capital Charge
- Numerical Example using Indirect Method
- Conclusions

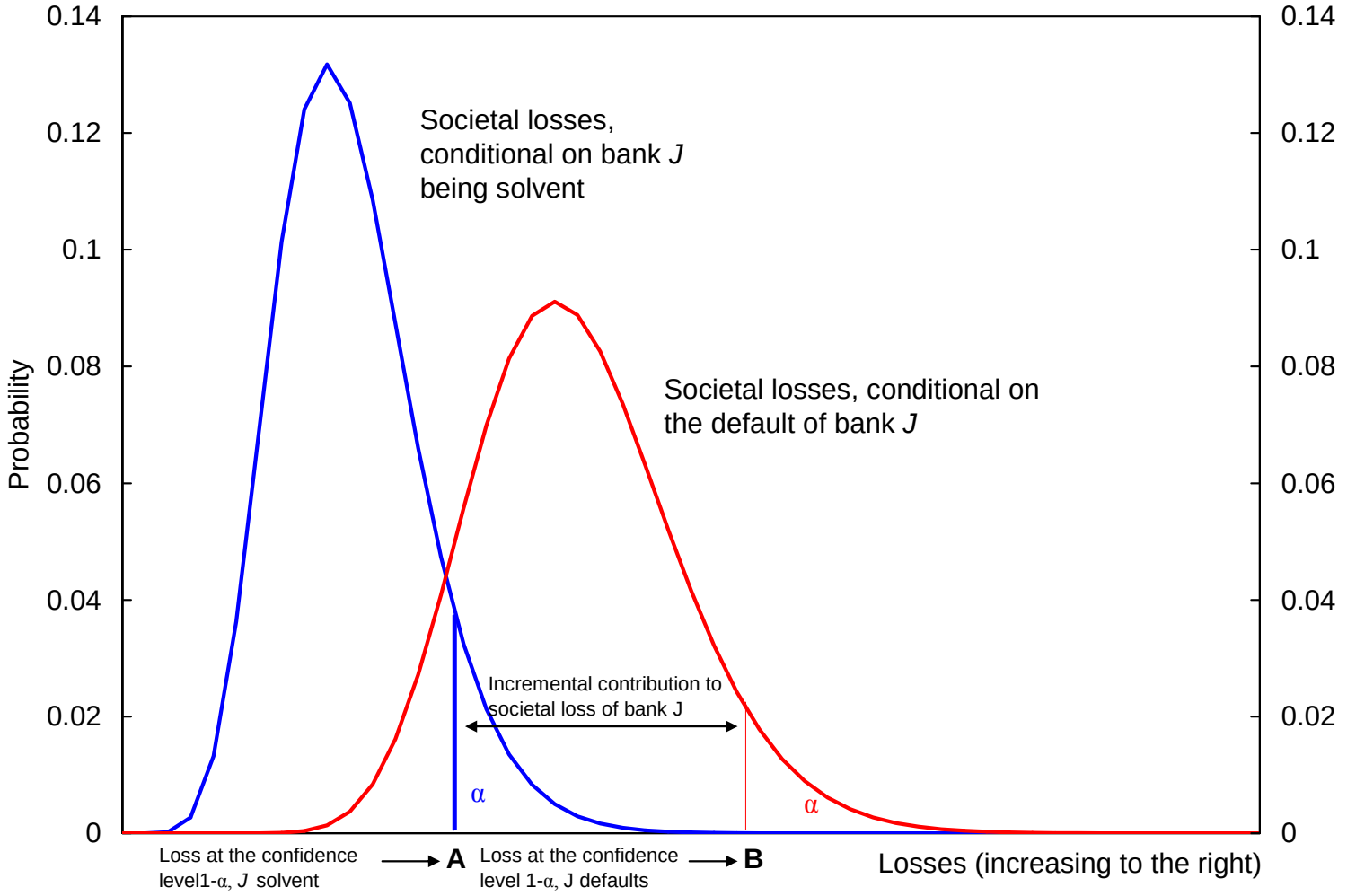
Systemic risk contribution= Incremental contribution to Risk

- Systemic risk captured by tail of aggregate loss distribution, e.g. tail measures of risk VaR, Expected Shortfall
- Systemic risk of a banking institution = change in the tail of the loss distribution prompted by the default of an institution.
- For bank *i* and set of *N*-1 other banks in the system
- Systemic risk contribution = Difference between

  Tail Measure of *N-1* aggregate loss distribution if bank *i* defaults and

  Tail Measure of *N-1* aggregate loss distribution if bank *i* solvent

TCTF Capital Charge: Incremental Contribution to Societal Loss



TCTF Capital Charge: From Incremental Contribution to Capital Charges

- Incremental contribution to societal loss of Bank J =

  VaR_{α} (Loss distribution when J defaults) –

  VaR_{α} (Loss distribution when J is solvent)

- Too-Connected-to-Fail capital charge for Bank J =

  Incremental contribution to societal loss of Bank J ×

  Probability of default of Bank J

Two-bank example

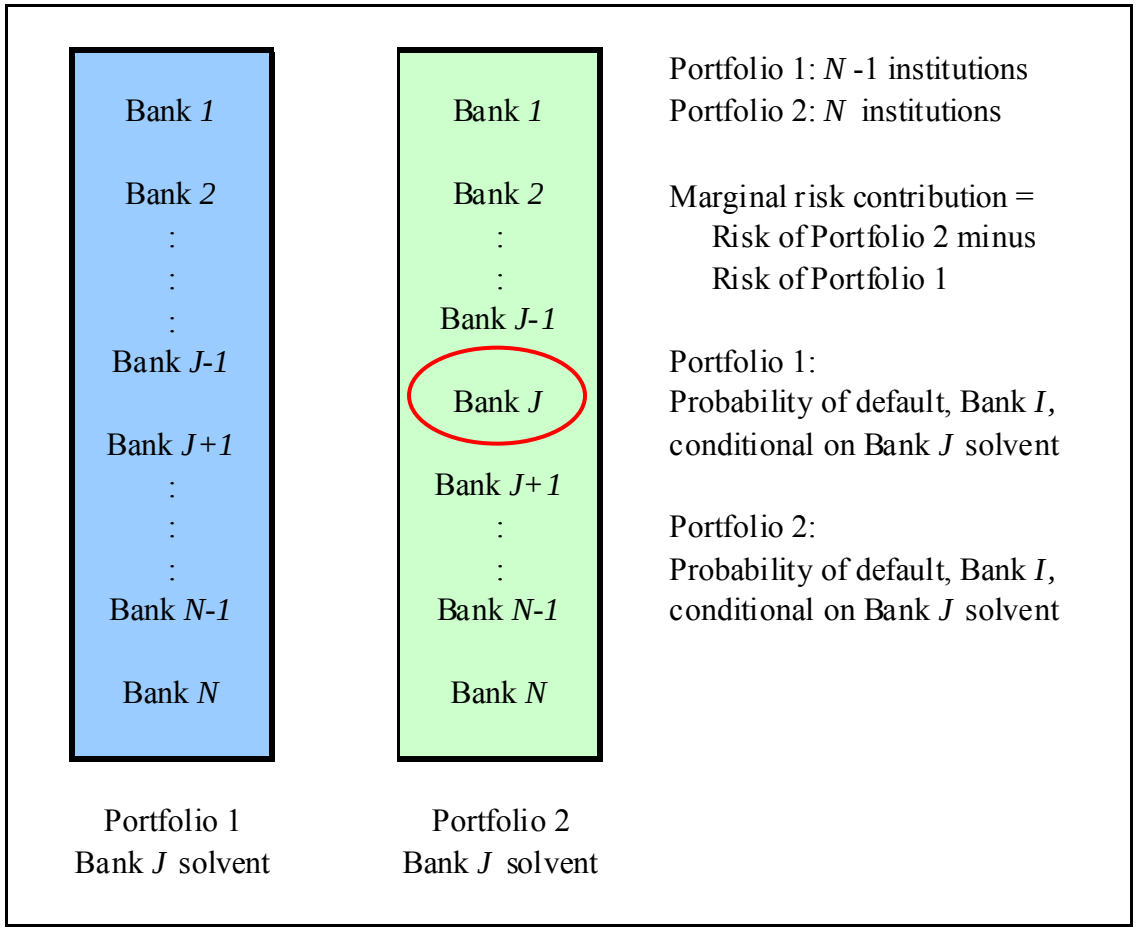
- Two identical banks, *A* and *B*.
- Deposits: $100 million.
- Probability of default = 5 percent.
- Probability of default if other bank defaults = 6 percent.
- If bank defaults, all deposits are lost.
- Deposits fully guaranteed by government.

Two-bank example

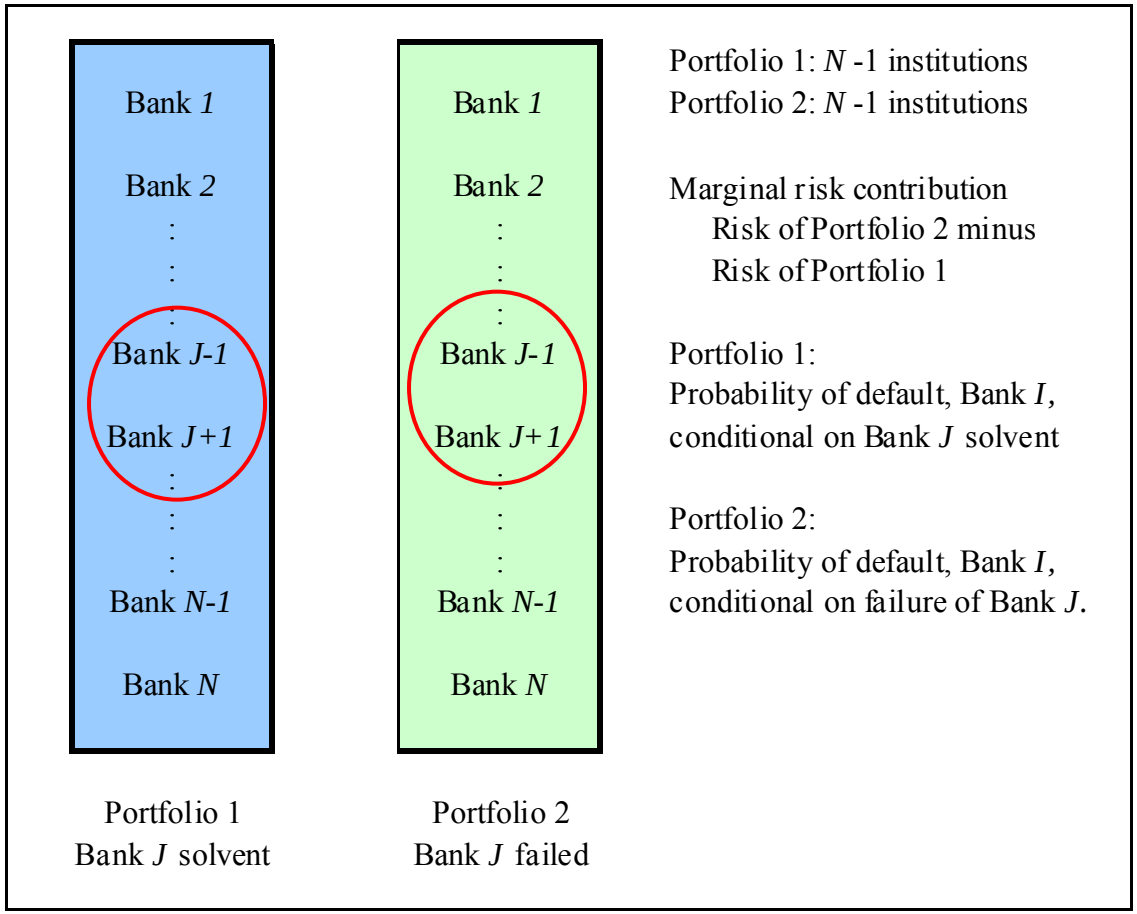
Calculation of TCTF Capital Charge for Bank B:

- If Bank *B* does not default, the expected loss to the government if Bank A defaults is 0.05 x 100 = **$5 million**.
- If Bank *B* defaults, the expected loss to the government if Bank A defaults is 0.06 x 100 = **$6 million**.
- The ***incremental loss*** due to the failure of Bank *B* is **$1 million**
- (**$6 million** - **$5million**).
- The TCTF capital charge should be proportional to the incremental loss of **$1 million**

Tarashev et al, 2009 Capital Charge Approach



Chan-Lau, 2010, Capital Charge Approach



Too-Connected-to-Fail Capital Charge Approach: Step-by-step calculations

- Step 1: For each institution other than *J*, specify the probability of default of the remaining institutions in the events that institution *J* survives or defaults.
- Step 2: For each institution in step 1 determine the *societal* exposure at default and the societal loss given default for each of the two events, i.e. potential losses incurred by government.
- Step 3: Construct the societal loss distributions for incremental portfolio in two events: that *J* survives or defaults.
- Step 4: Pick up a given confidence level, i.e. typical values for VaR 95 percent, 99 percent and 99.5 percent (or Expected Shortfall).
- Step 5: Calculate the VaR in the conditional societal loss distributions at the specified confidence level.
- Step 6: Calculate the incremental contribution to societal loss as the difference between the VaR (*J* defaults) and VaR (*J* survives).
- Step 7: Calculate the TCTF capital charge as the product of the probability of default of institution *J* and its incremental contribution to societal loss.

Too-Connected-to-Fail Capital Charge Approach: The Difficult Steps

- Step 1: For each institution other than *J*, specify the probability of default of the remaining institutions in the events that institution *J* survives or defaults.

  J defaults
  - CoRisk Analysis (direct and indirect exposures, reduced form).
  - Network analysis (direct exposures, requires data on exposures).

- Step 2: For each institution in step 1 determine the *societal* exposure at default and the societal loss given default for each of the two events, i.e. potential losses incurred by government.
  - Regulatory agency criteria.
  - Deposits at banking institutions.
  - Pension fund claims
  - Senior creditor claims (as observed in recent crisis).

- Step 3: Construct the societal loss distributions for incremental portfolio in two events: that *J* survives or defaults.
  - Portfolio credit risk models.

TCTF Capital Charges: Numerical Example

Data and Model Assumptions used in Example

- Analysis covers 26 financial institutions in 9 countries: U.S., Canada, Spain, France, Germany, Italy, Switzerland, United Kingdom and the Netherlands.
- Weekly expected Default Frequencies (EDFs) from Moody's KMV use as proxy for probabilities of default.
- Data sample covers period May 2, 2003 – February 27, 2009.
- Probabilities of default in the event of an institution failure calculated using CoRisk analysis; PCA analysis used to find common risk factors.
- One-factor Gaussian model used to model loss distributions.
- BCBS (2004) formula for correlations used.
- Societal exposure at default in the event of default equal to total debt.
- Loss given default is 100 percent, so societal losses equal to total debt.

Probabilities of Default: CoRisk Analysis

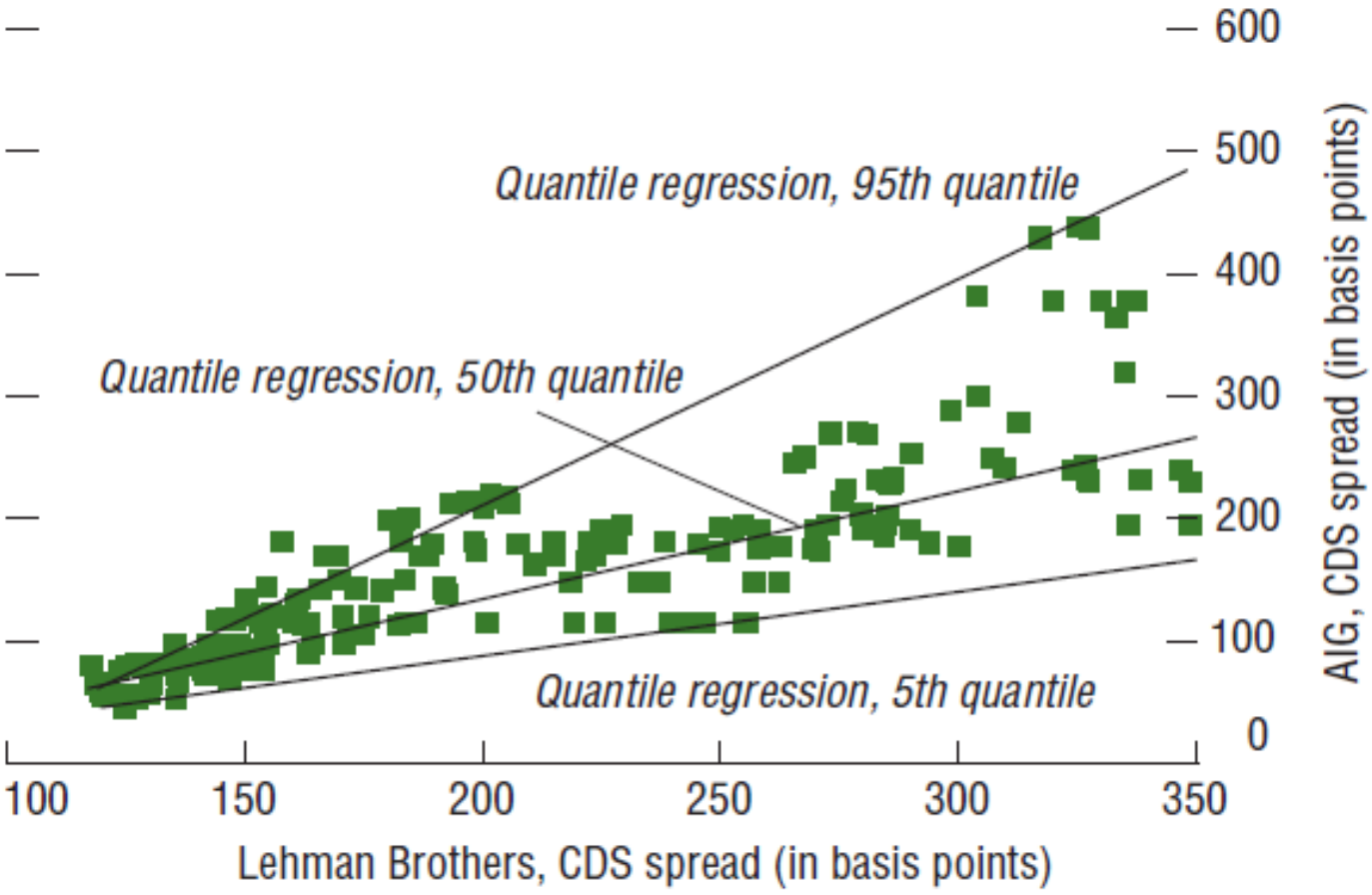
- Quantile regression typical equation

$$PD_i = \alpha_\tau + \sum_k^K \beta_{\tau,k} R_k + \beta_{\tau,j} PD_j$$

- Choice of appropriate quantile to use in TCTF capital charge:
  - Subject to discretion of regulatory agency.
  - Tradeoff: efficiency vs. safety.
  - Normal periods: 50 percent quantile.
  - Cautious approach: 95th or 99th quantiles.
  - High quantiles equivalent to "stress regimes."
- Choice of probability of default
  - Set it equal to 1.
  - Set it equal to a higher quantile of the historical distribution, i.e. 95th or 99th percentiles.
- Choice of common factors: 95th or 99th quantiles = stress scenario

The ToolKit - Probabilities of Default: CoRisk Analysis

AIG and Lehman Brothers CoRisk



Numerical Example
Average increase in the Probability of Default due to Failure of Other Institution, Country Averages

	United States	Canada	Spain	France	Germany	Italy	Switzerland	United Kingdom	Netherlands
United States	327	215	260	289	258	333	281	252	317
Canada	133	50	63	100	92	146	72	74	64
Spain	201	57	55	76	23	70	32	63	56
France	195	160	154	159	163	166	279	157	128
Germany	209	184	214	172	137	196	176	186	196
Italy	204	95	151	141	76	162	45	84	145
Switzerland	141	75	67	102	59	85	114	115	100
United Kingdom	146	75	112	123	119	128	134	104	122
Netherlands	181	140	120	78	42	84	136	85	152

Numerical Example

	Probability of default	Assets	Total debt	Incremental portfolio, notional amount	Value-at-risk, incremental portfolio				Too-Connected-to-Fail, capital charge			
					event = survival (in percent of incremental portfolio)		event=default (in percent of incremental portfolio)		(in $ billion)		(in percent of assets)	
	(in percent)	($ billion)	($ billion)	($ billion)	confidence level		confidence level		confidence level		confidence level	
					95	99.5	95	99.5	95	99.5	95	99.5
Morgan Stanley	5.38	659	289	8929	18.9	20.1	25.1	26.7	29.8	31.9	4.52	4.83
Goldman Sachs	1.63	876	322	8895	19.0	20.1	25.6	28.2	9.6	11.8	1.10	1.35
Citigroup	20.21	1938	670	8548	16.1	17.6	32.8	35.4	287.7	307.2	14.84	15.85
Wells Fargo	0.44	1310	375	8843	18.3	21.5	24.6	27.2	2.5	2.3	0.19	0.17
JP Morgan	1.85	2175	633	8584	19.7	21.0	27.8	29.3	12.9	13.2	0.59	0.61
Bank of Nova Scotia	0.39	414	44	9174	18.4	20.4	23.7	26.1	1.9	2.1	0.46	0.50
Canadian Imperial Bank	0.43	289	38	9180	17.7	18.4	24.5	26.4	2.7	3.1	0.93	1.08
Royal Bank of Canada	0.66	594	139	9079	18.6	19.6	26.7	28.9	4.8	5.5	0.81	0.93
BBVA	0.57	543	121	9097	17.0	18.8	27.3	30.3	5.4	6.0	0.99	1.10
Santander	0.40	1050	39	9179	17.9	18.7	29.1	30.3	4.1	4.3	0.39	0.41
Banque Nationale Paribas	0.71	2880	420	8798	19.2	21.0	23.6	25.7	2.7	2.9	0.09	0.10
Credit Agricole	0.76	2292	487	8731	19.4	22.7	30.6	32.8	7.5	6.7	0.33	0.29
Societe Generale	3.08	1567	224	8994	18.3	19.9	30.9	33.8	35.0	38.5	2.24	2.45
Commerzbank	7.80	861	429	8789	19.2	19.5	29.3	31.2	69.2	79.9	8.04	9.29
Deutsche Bank	3.52	3050	483	8734	19.4	20.5	25.8	27.8	19.8	22.4	0.65	0.73
Intesa	0.29	878	388	8830	19.1	20.9	31.3	32.7	3.1	3.0	0.35	0.34
Mediobanca	1.76	102	70	9148	18.1	19.2	30.4	33.0	19.7	22.2	19.37	21.77
Credit Suisse	1.22	1098	439	8779	18.1	19.3	28.2	31.4	10.8	13.0	0.99	1.18
UBS	0.12	1899	512	8705	19.4	24.0	30.2	32.3	1.1	0.9	0.06	0.05
Barclays	4.39	2948	693	8525	17.3	19.8	24.1	27.4	25.4	28.3	0.86	0.96
HSBC	0.48	2527	696	8522	19.4	21.0	28.5	31.4	3.7	4.2	0.15	0.17
Lloyds	0.82	436	38	9180	18.5	20.4	27.8	30.3	7.0	7.5	1.61	1.72
Royal Bank of Scotland	2.83	2402	1021	8197	17.5	20.1	23.9	25.8	14.8	13.0	0.62	0.54
Standard Chartered	0.24	428	74	9143	18.5	19.6	26.6	29.5	1.8	2.2	0.42	0.52
ABN Amro	0.06	940	176	9042	18.7	19.7	26.5	29.0	0.4	0.5	0.05	0.05
ING	4.88	1832	398	8819	19.2	20.9	28.3	30.7	39.4	41.9	2.15	2.29

Conclusions and Open Questions

- Intuitive concept; charges proportional to incremental contribution to losses.
- Integrates Credit Portfolio models, CoRisk and Network Analysis into Basel II.
- Easy to calculate: toolkit of simple models to calculate probabilities of default and loss distributions.
- Easy to adopt by regulatory agencies: concepts related to Basel II
- Simplicity increases transparency and facilitates communicating results.
- Perimeter of regulation: Accommodates financial and non-financial firms.

- Procyclicality?
- Who should pay the charge?
- Harmonization of Regulatory Practices?

Thank you