Quantifying Structural Subsidy Values for Systemically Important Financial Institutions

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Quantifying the "Too Big to Fail" Subsidy
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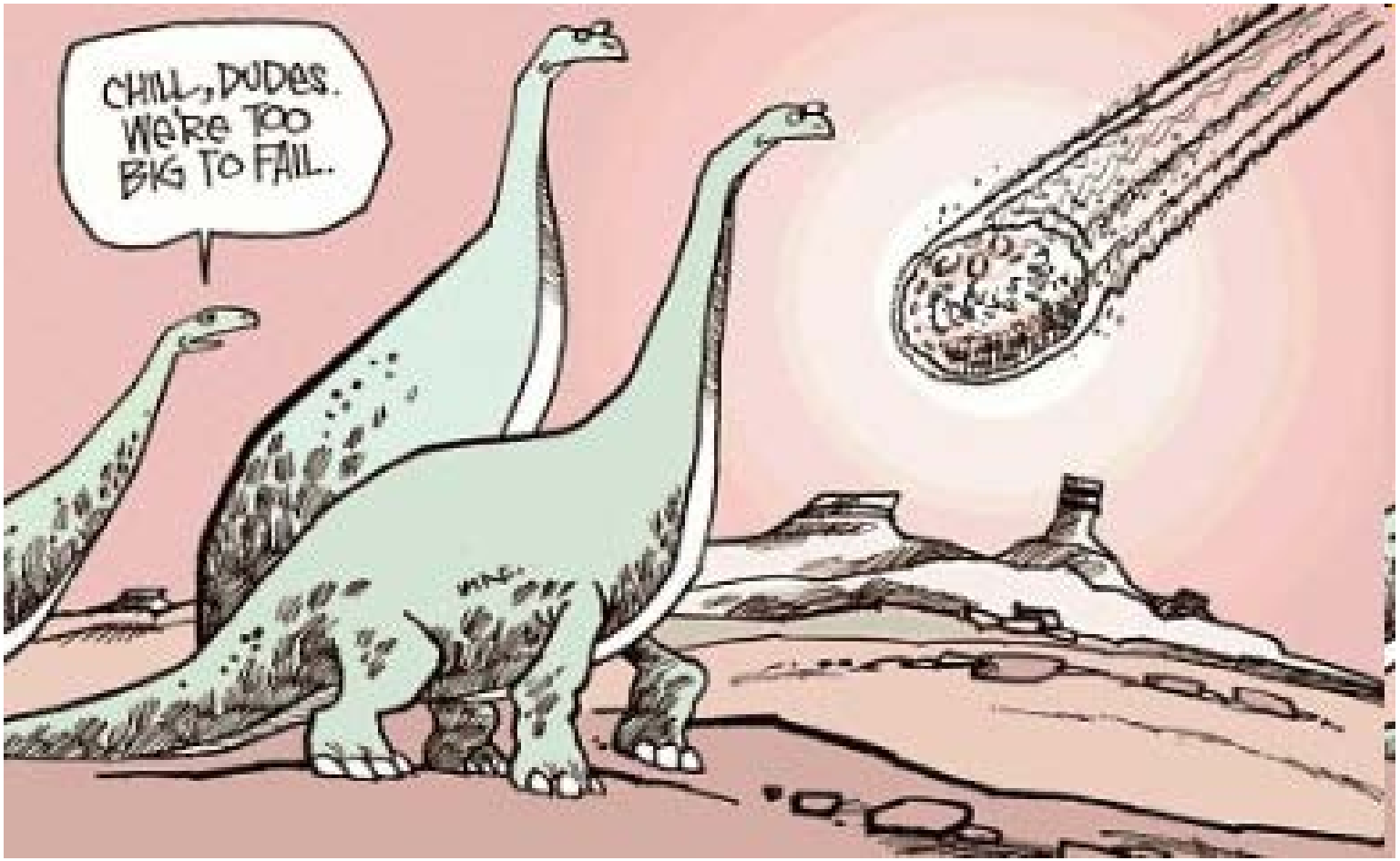
Outline

Key issue 1) Unfair Benefits of TBTF

Key issue 2) Moral hazard induced by TBTF



Overview

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- How much is the value of TBTF?
- It should reflect in the daily funding cost as investors see SIFIs' debts are safer.
- Funding cost differentials:
  - TBTF subsidy
  - Economy of scale and scope
  - Monopolistic rents
  - (G.E. effects of the above)
- This paper utilizes credit rating agency's evaluation on government support and estimates that TBTF subsidy was on average 60bp at end-2007 and increased to 80bp at end-2009.

Earlier Papers

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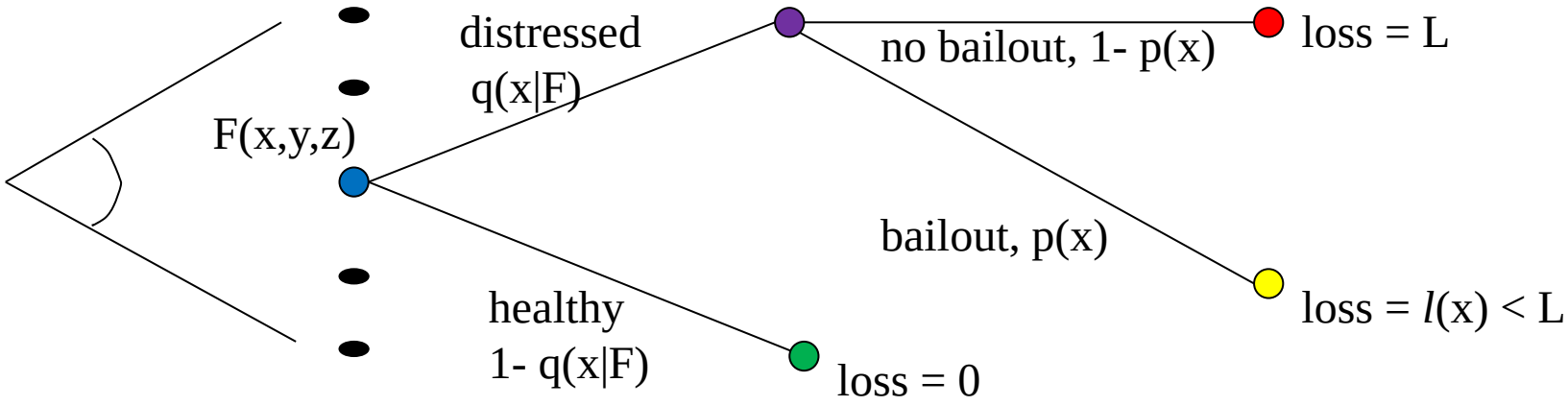
- **Earlier work: Ueda and Weder di Mauro 2010**
  - **Simple OLS. Also reports event study on changes in subsidy**
- **Precedent rating approach: Soussa 2000, Rime 2005**
  - **Fewer countries, lack of controls, not for the current crisis**
- **Use a crisis event: Baker and McArthur, 2009**
  Difference in funding cost small/large, before/after TARP
  - **Quarterly data, US banks**
  - **Change in subsidy**
- **Real-time approach using option theory: IMF (US FSAP) 2010, Gray and Jobst 2010, Moody's 2011**
  - **Highly volatile market valuation for the support**

What are we estimating?



Today	**Tomorrow**	**Tomorrow**
Fundamentals (profits, debt/asset, etc)	Distressed with prob. q	Bailout With prob. p
F(x,y,z), incr. in all x: TBTF protection y: Scale/scope econ. z: Monopolistic rents	q'(x|F)>0 or <0 x: TBTF protection may increase risk q (moral hazard)	bailout intensity x p'(x) > 0 *l*'(x) < 0
Funding cost = CDS w/ different F	Credit spread given F = q(x|F)*ELGD	Expected Loss Giv. Def. = (1-p(x))*L + p(x) *l*(x)

What are we estimating?

- Simple difference in funding costs = Credit spreads with different fundamentals F(x, y,z)
  - Contaminated by economy of scale/scope and monopolistic rents.
    - If conducting regression, how to control these factors is the key.
  - However, positive effects on fundamentals due to TBTF protection can be thought of as a part of the implicit subsidy.
    - This portion is not counted in credit rating or option pricing approaches.
- Credit spread given F = $q(x|F)* [(1-p(x))*L+p(x)*l(x)]$
  - Distress prob q(x|F) can be increasing with TBTF protection but ELGD is decreasing with TBTF protection.
  - If increase in risk q(x|F) stems from the moral hazard due to TBTF protection, increase in credit spread due to increase in risk q(x|F) should not be included in the value of TBTF protection.

  → CDS spread itself is not so informative on TBTF subsidy.

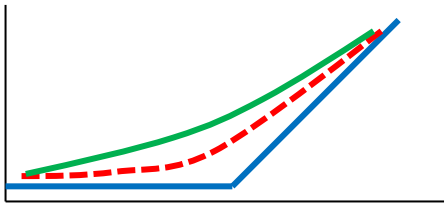
What are we estimating?

- **Ideal estimate of expected value of bailouts = Q(F)*(L – ELGD)**
  - **Better use historical average distress probability Q(F).**
  - **Often calculated from equity price movements (e.g., Moody's).**

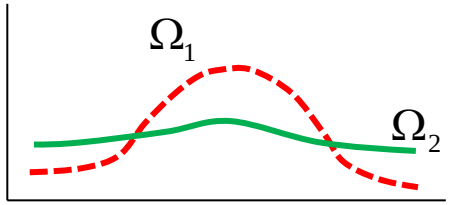
$$q(x \mid F) = \int_{\underline{\varepsilon}}^{DB} V(A(\varepsilon))\, \Omega_x(d\varepsilon \mid F)$$

$$Q(F) = \int_{\underline{\varepsilon}}^{DB} V(A(\varepsilon))\, \Lambda(d\varepsilon \mid F)$$

$$\text{where } \Lambda = \{\Omega_1, \Omega_2, \cdots \Omega_x \cdots\}.$$



Expected return to claim holders when the floor value is protected.



Prob. distribution with fatter tails

What are we estimating?

- **Expected value of bailouts under the option approach**
  = Q(F)*Hist. ELGD – q(x|F)*[(1-p(x))*L+p(x)*l(x)]
  - **Equity price→ estimate Q(F) ; CDS spread represents q*ELGD**
  - **q(x|F) may be higher in tail and historical average ELGD may be lower than true ELGD in crisis.**

- **Expected value of bailouts under the credit rating approach**
  = Q(F)*Hist. ELGD – Q(F) * [(1-p(x))*L+p(x)*l(x)])
  - **Exp. loss implied by the stand-alone rating = Q(F) * Hist. ELGD**
  - **Exp. loss implied by the overall rating with support = Q(F) *ELGD**
  - **Big assumption: rating agency's evaluation of government support x is more or less OK.**
    - **The expected value is not the same as the difference in CDS spreads**
  - **Empirical implementation:**
    - **Find impacts of the support evaluation on the overall ratings (*uplift*).**
    - **Apply the rating-dependent difference in long-term average funding costs to the estimated rating uplift.**

What are we estimating? time-varying vs structural

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- **Time-varying market valuation for the support (option approach)**
  - Good to have continuous updates of the expected bailout intensity x
  - Caveats: Potential dramatic changes in prob of distress q(x|F)
    - Fatter with moral hazard, etc, in normal times as well as near distress
    - Thinner with cheaper near-future funding costs, etc, in crisis times
  - Potential malfunction of the equity and CDS market in severe crisis
    - Even in quieter periods, CDS market is thin (liquidity risks).
- **Estimate the structural subsidy values (credit rating approach)**
  - Exploit stable expectations for state support in credit ratings
    - Moody's: mechanical (yet sensible) expectation on historical records
  - Use long-run average value of rating bonus
  - Based on large worldwide sample of banks

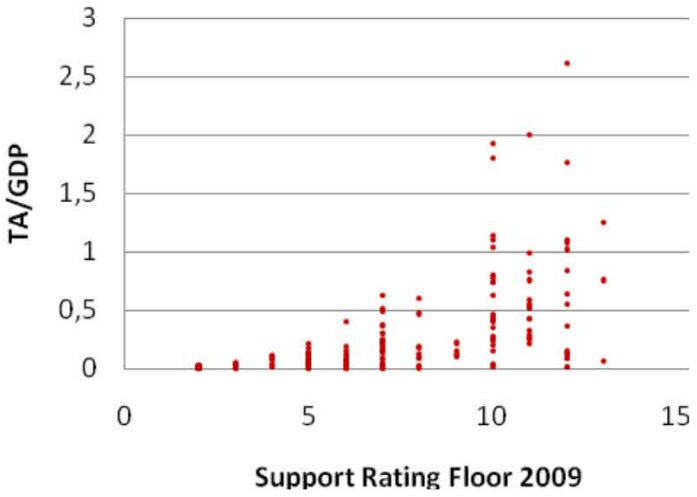
Data: Credit Ratings for Banks (Fitch)

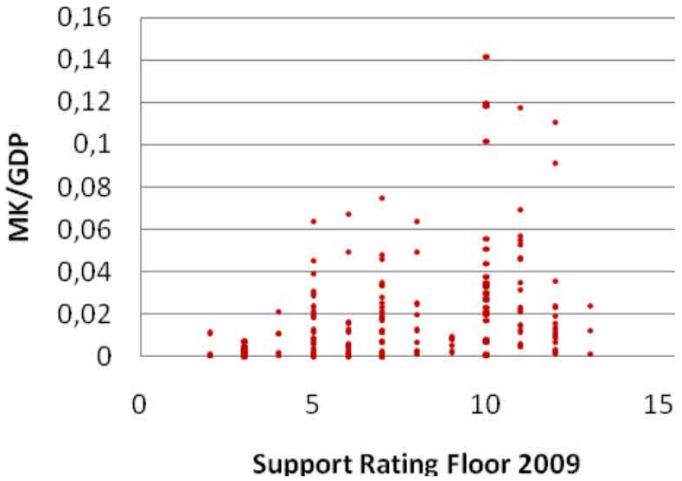
- Long-term credit ratings (overall ratings): AAA to D (16 values)
- Individual ratings: A to E, with gradations like A/B (11 values)
  - Fitch changed this in 2011 to the same scale to LT ratings above.
- Support ratings: 5 to 1 (5 values)
  - Represents probability of support received.
  - E.g. highest rating description: "A bank for which there is extremely high probability of external support. The potential provider of support is very highly rated in its own right and has a very high propensity to support the bank in question. This probability of support indicates a minimum long-term rating floor of `A-'."
- Support rating floor: AAA to D (16 values) (16 values) or NF
  - At least this level is given to its Long-Term ratings.
  - This is given whenever the Support Rating is based on potential sovereign support.
  - Absence (NF) means that the support is expected from a parent bank.

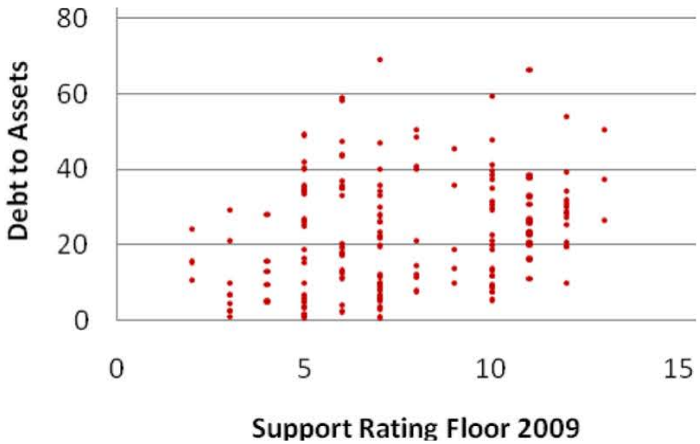
Variables

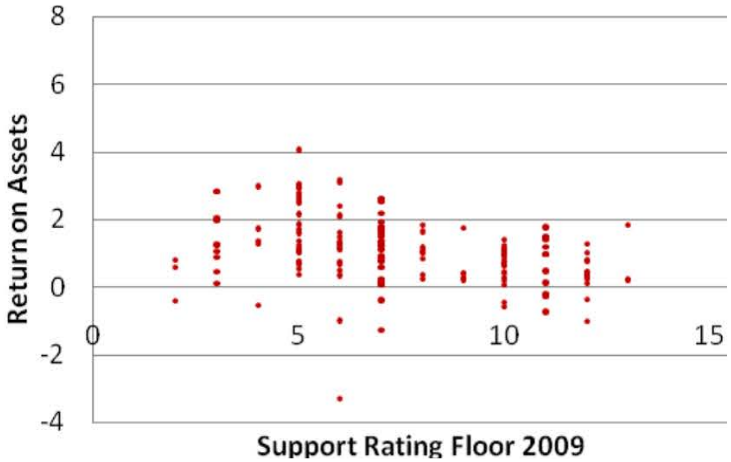
- **Ratings variables**
  - *LT* – overall assessment of an issuers vulnerability to default
  - *INDV* – the financial strength on a standalone basis
  - *Spprt* – probability of external support (parent or government)
  - *Parent* – only for parent bank support (support floor = NF)
  - Svrgn – ability to pay of government
- **Other variables**
  - *Dev* – dummy for developing countries
  - *RoA, D/A, TA/GDP* – Firm level balance sheet controls (listed firms only)
- **Structure of data**
  - Two cross sections : end 2007 and end 2009
  - Total 895 banks in 95 countries
  - US: 24%, UK 4.5%, (GER, FRA,IT) 14%

Correlations: support and indicators of size/strength









Empirical Methodology

- **Benchmark**

$$LT_{ik} = f\left(\alpha_{0k} + \alpha_1 INDV_{ik} + \alpha_2 Spprt_{ik} + \alpha_3 Svrgn_k + \varepsilon_{ik}\right).$$

- **Accounting for parent support and developing country effects**

$$LT_{ik} = f(\alpha_{0k} + \alpha_1 INDV_{ik} + \alpha_2 Spprt_{ik} + \alpha_3 Svrgn_k + \alpha_4 Dev + \alpha_5 Dev * Spprt + \alpha_6 Parent + \alpha_7 Parent * Spprt + \alpha_8 Dev * Parent * Spprt + \varepsilon_{ik}).$$

- **Estimation: Ordered Probit**

- **Additional Robustness**
  - **Dropping NF / balanced sample / listed Firms only /**
  - **Using balance sheet variables to substitute the individual ratings**

Benchmark regression results

	end-2007				end-2009			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
INDV	0.8420***	0.8587***	0.8911***	0.8981***	0.6426***	0.6295***	0.6405***	0.6324***
	[13.923]	[13.221]	[14.063]	[13.543]	[15.405]	[15.128]	[15.179]	[14.999]
Spprt	0.6769***	0.6488***	0.6043***	0.5981***	0.8347***	0.8343***	0.8190***	0.8330***
	[14.565]	[14.687]	[12.861]	[13.073]	[24.457]	[20.653]	[23.607]	[20.281]
Svrgn	0.1586***	0.1580***	0.1496***	0.1505***	0.2043***	0.1862***	0.2034***	0.1888***
	[7.596]	[5.661]	[7.017]	[5.319]	[15.867]	[9.528]	[15.375]	[9.454]
Dev		-1.0502**		-0.8090		-0.2942		-0.1139
		[-2.061]		[-1.548]		[-0.913]		[-0.346]
Dev*Spprt		0.3413***		0.2349*		0.0411		-0.0673
		[3.122]		[1.818]		[0.524]		[-0.795]
Parent			-1.4963***	-1.3474***			-0.4807	-0.7939*
			[-3.598]	[-2.802]			[-1.379]	[-1.812]
Parent*Spprt			0.4485***	0.3912***			0.1304	0.1682*
			[4.621]	[3.614]			[1.557]	[1.775]
Dev*Parent*Spprt				0.0581				0.1491***
				[0.880]				[2.764]

Benchmark regression results for "cuts"

cut1	5.1438***	4.7261***	5.1591***	4.8311***	4.6659***	4.3349***	4.6057***	4.3688***
	[13.138]	[7.660]	[12.621]	[7.864]	[18.550]	[10.552]	[17.593]	[10.248]
cut2	5.6144***	5.2603***	5.6267***	5.3506***	5.4591***	5.1070***	5.3929***	5.1293***
	[14.130]	[8.749]	[13.540]	[8.909]	[22.052]	[12.840]	[20.849]	[12.391]
cut3	6.2440***	5.9880***	6.2347***	6.0347***	6.0067***	5.6760***	5.9359***	5.6919***
	[15.100]	[10.181]	[14.423]	[10.175]	[24.079]	[14.737]	[22.636]	[14.126]
cut4	7.0020***	6.9135***	6.9829***	6.9280***	6.3882***	6.0827***	6.3148***	6.0937***
	[15.560]	[11.533]	[14.898]	[11.432]	[24.181]	[15.886]	[22.737]	[15.153]
cut5	7.7227***	7.6818***	7.7201***	7.6966***	6.9726***	6.6471***	6.8986***	6.6562***
	[15.807]	[12.323]	[15.165]	[12.261]	[24.629]	[17.059]	[23.232]	[16.334]
cut6	8.0699***	8.0927***	8.0856***	8.1140***	7.4864***	7.1676***	7.4154***	7.1813***
	[15.857]	[12.680]	[15.226]	[12.690]	[25.182]	[18.207]	[23.976]	[17.556]
cut7	8.8427***	8.8983***	8.9097***	8.9569***	8.3101***	7.9549***	8.2455***	7.9843***
	[15.776]	[13.174]	[15.091]	[13.161]	[25.602]	[19.567]	[24.588]	[19.005]
cut8	9.5181***	9.5750***	9.6097***	9.6537***	9.0993***	8.7386***	9.0371***	8.7785***
	[16.108]	[13.729]	[15.441]	[13.732]	[26.427]	[20.599]	[25.480]	[20.100]
cut9	10.1986***	10.2607***	10.3152***	10.3616***	9.7689***	9.3845***	9.7077***	9.4296***
	[16.495]	[14.239]	[15.822]	[14.242]	[27.238]	[21.584]	[26.344]	[21.102]
cut10	11.2063***	11.3023***	11.3602***	11.4391***	10.5526***	10.1858***	10.4958***	10.2416***
	[16.840]	[14.814]	[16.159]	[14.823]	[27.772]	[22.368]	[26.943]	[21.921]
cut11	11.9928***	12.0593***	12.1686***	12.2192***	11.2286***	10.8511***	11.1723***	10.9120***
	[17.041]	[15.094]	[16.373]	[15.113]	[28.393]	[22.988]	[27.627]	[22.552]
cut12	12.6501***	12.7082***	12.8473***	12.8895***	12.3060***	11.9222***	12.2510***	11.9899***
	[17.247]	[15.468]	[16.538]	[15.463]	[28.760]	[23.428]	[28.013]	[22.977]
cut13	13.7266***	13.7854***	13.9701***	14.0093***	13.6824***	13.2893***	13.6336***	13.3626***
	[17.488]	[15.919]	[16.745]	[15.856]	[27.436]	[23.149]	[26.774]	[22.705]
cut14	14.7401***	14.8605***	14.9819***	15.0838***	15.0518***	14.6514***	14.9996***	14.7263***
	[16.568]	[15.501]	[15.999]	[15.438]	[27.044]	[23.621]	[26.511]	[23.301]
cut15	15.6582***	15.7382***	15.8251***	15.9054***	15.2666***	14.8644***	15.2088***	14.9382***
	[17.376]	[16.165]	[16.776]	[16.066]	[24.419]	[21.838]	[24.151]	[21.639]

Effect of one notch increase in Spprt on LT rating

	All Countries		Advanced Countries	
	2007 (column 1)	2009 (column 5)	2007 (column 4)	2009 (column 8)
Benchmark (Table 4)	0.90	1.10	0.76	1.10
Without NF (Table 5)	0.89	1.23	0.55	1.05
Listed Firms (Table 6)	0.68	0.93	0.61	0.95
Fundamentals (Table 7)	0.75	0.89	0.56	0.80

LT rating bonus by gov support, selected countries

	2007		2009	
	Benchmark (Table 4)	Fundamentals (Table 7)	Benchmark (Table 4)	Fundamentals (Table 7)
Australia	3.11	2.58	4.51	3.63
Brazil	2.20	1.82	3.06	2.47
France	3.97	3.29	4.79	3.86
Germany	3.99	3.30	5.06	4.08
Greece	3.09	2.56	3.94	3.17
Hong Kong	3.35	2.78	4.25	3.42
Ireland	3.72	3.08	5.24	4.22
Italy	3.15	2.61	4.03	3.24
Japan	3.47	2.88	4.25	3.42
Netherlands	3.09	2.56	4.41	3.55
Portugal	3.51	2.91	4.21	3.39
Spain	2.97	2.46	3.62	2.92
Switzerland	3.15	2.61	3.86	3.11
Turkey	2.21	1.83	3.25	2.62
United Kingdom	3.31	2.75	4.13	3.32
United States	1.78	1.47	2.39	1.93
(U.S. top 45)	2.88	2.39	4.51	3.63
Average	3.11	2.58	4.09	3.29
(Using U.S. top 45)	*3.20*	*2.65*	*4.19*	*3.38*

Conclusions

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- **Total gov. subsidy to banks through expected support**
  - **Was already significant before crisis**
  - **Has increased further during crisis**
- **Total of support increases due to**
  - **Higher level of support**
  - **Higher effect of per unit of support**
- **Advanced economies have caught up with EMs**
  - **and surpassed them in many cases**
  - **Highest level: Germany and Ireland**
  - **Largest change: US (top 45)**
- **Some changes after recent reforms (a follow-up study by Schafer, Schnabel, and Weder di Mauro, 2013)**

Conclusions

- Interpretation in bp
  - One notch difference in LT rating implies 22 bp on average (Soussa, 2000, for 1920-1999 data)
  - Total funding subsidy about 60 bp in 2007 and about 80 bp in 2009
  - Individual ratings in 2007 was better than in 2009. If this is taken into account, then the estimates are 20 bp and 80 bp, respectively.
- Implied subsidy/required corrective levy may be smaller
  - Competition may magnifies a small intervention through market share, risk taking, etc. (effects apply to both the subsidized and non-subsidized firms). e.g., Gropp, Hakenes and Schnabel, 2011.
- But, overall implied subsidy still appears larger than tax rates:
  - Germany: 2 – 6 bp for TL excl. deposit and capital
  - UK: 5 – 10bp for ST liability, half for LT liability
  - Sweden: 1.8 – 3.6 bp for TL
  - (there are other ways to correct distortion)

Thank you for your attention