A Pyrrhic Victory? Bank Bailouts and Sovereign Credit Risk

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Questions

1. Did financial sector bailouts ignite sovereign credit risk in the developed economies?
   - were there important immediate costs to the bailouts (as opposed to just distortions of future incentives)
2. What mechanisms underlie the relationship between financial sector and sovereign credit risk?
   - transmission of risks (spillover) between the sectors
   - trade-off between financial sector and sovereign credit risk
3. Does sovereign credit risk also feedback onto financial sector credit risk?
   - the ongoing banking crisis: impact of default risk in Greece, Ireland, Portugal, Spain, Italy

Motivation:
Bailout of Irish Banks

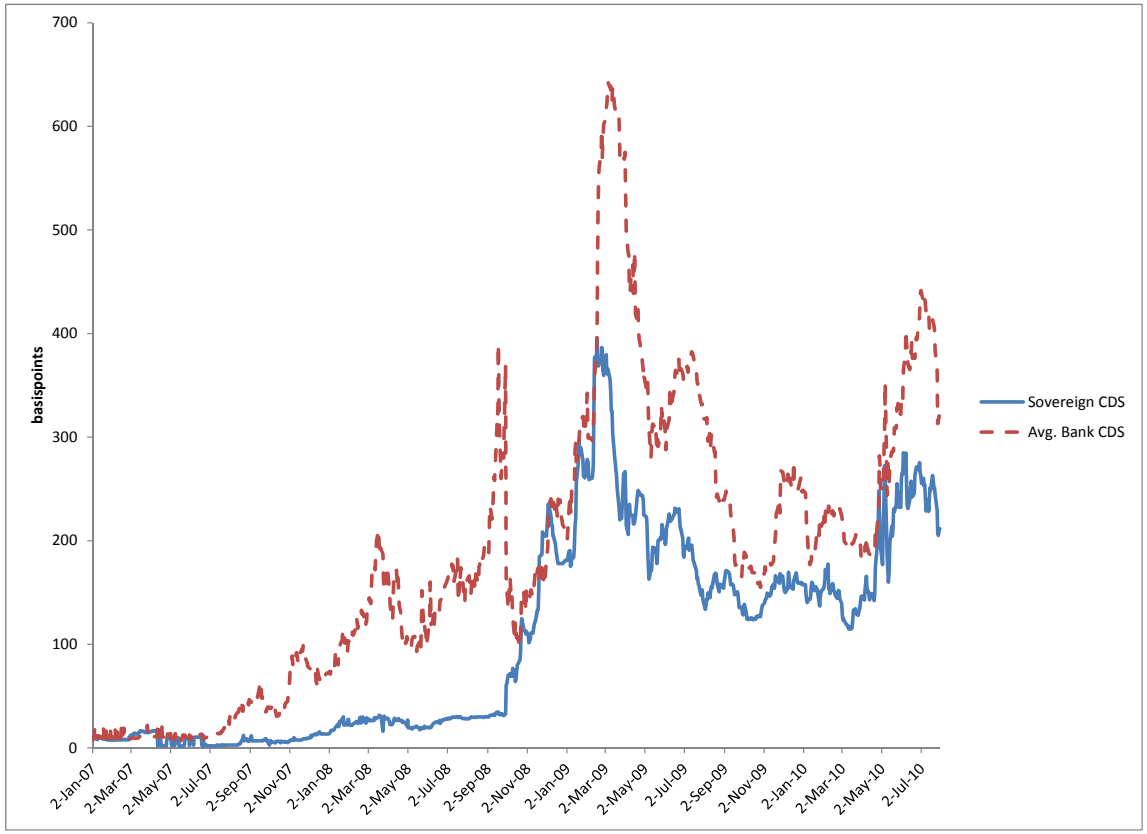
From Financial Sector Credit Risk to Sovereign Credit Risk

- On September 30, 2008 the government of Ireland announced a guarantee of all deposits of its six biggest banks
- Later all unsecured bondholders of these banks receive a government guarantee
- Credit default swap (CDS) fee for buying protection on Irish banks fell from 400 bps to 150 bps
- From the standpoint of stabilizing the financial sector, the end goal of the guarantees appeared to have been met
- What impact would these provisions have on the credit risk of the government of Ireland?

Bailouts and Risk Transfer

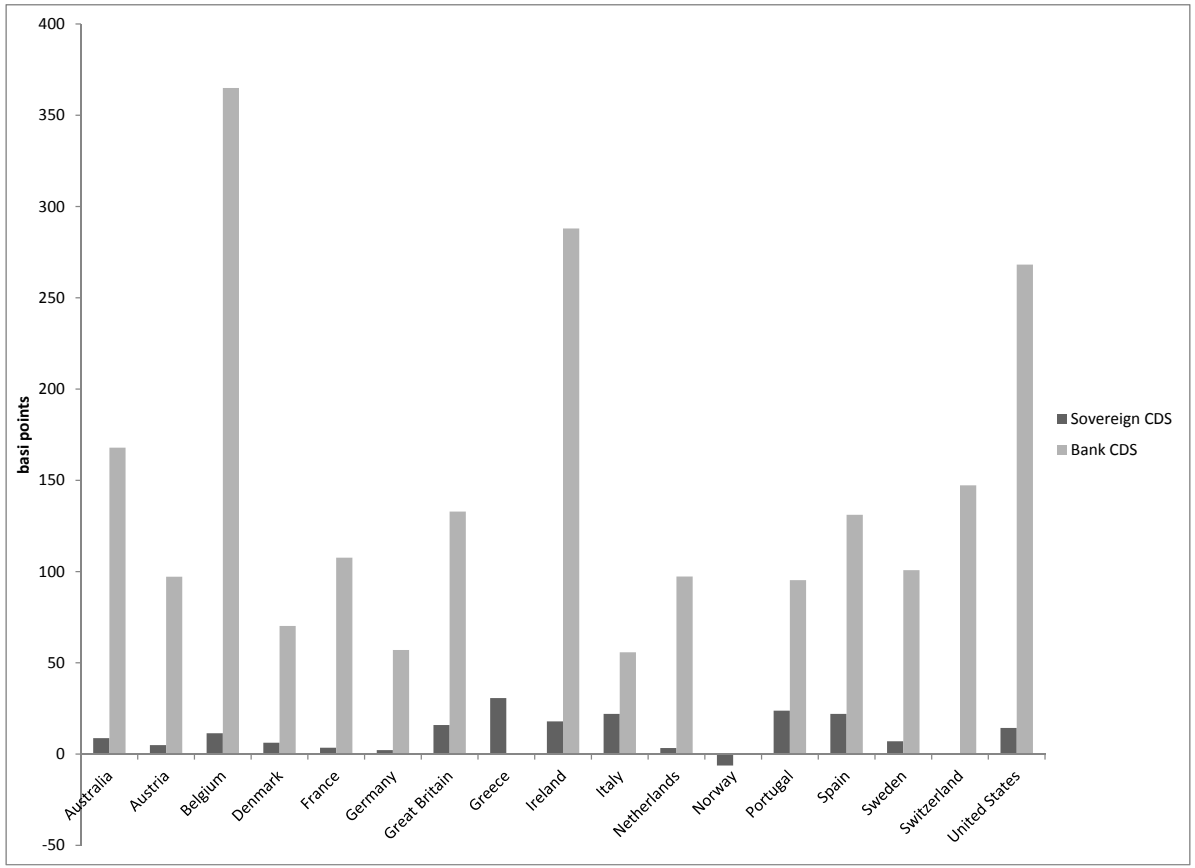
- Just one of the Irish banks, Anglo Irish, cost the government Euro 25 Billion or 11.26% of GDP by Aug'10
- Ireland received 85 Billion Euro rescue package by European Union and IMF in Nov'10 and now needs another 24 Billion Euro for lenders
- Total is approximately 70% of 2010 GDP

A Motivating Example: The Case of Ireland



- Chart similar across many countries:
  1. sovereign CDS close to 0 through first-half 2008
  2. post bailout announcement (9/30/2008): sovereign CDS jumps up, bank CDS drops down
  3. subsequent positive comovement

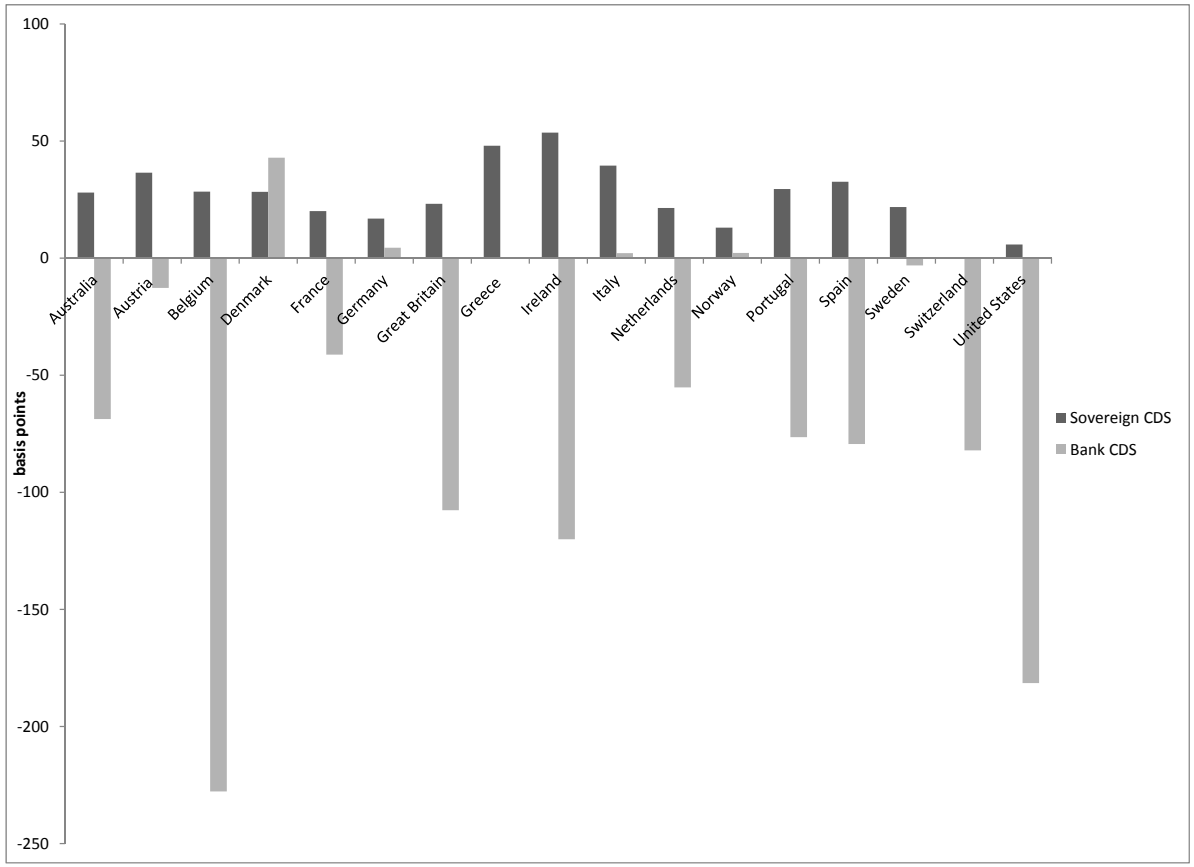
Pre-Bailouts: Europe



3/1/2007 – 9/26/2008

- bank CDS has increased substantially
- not much change in sovereign CDS

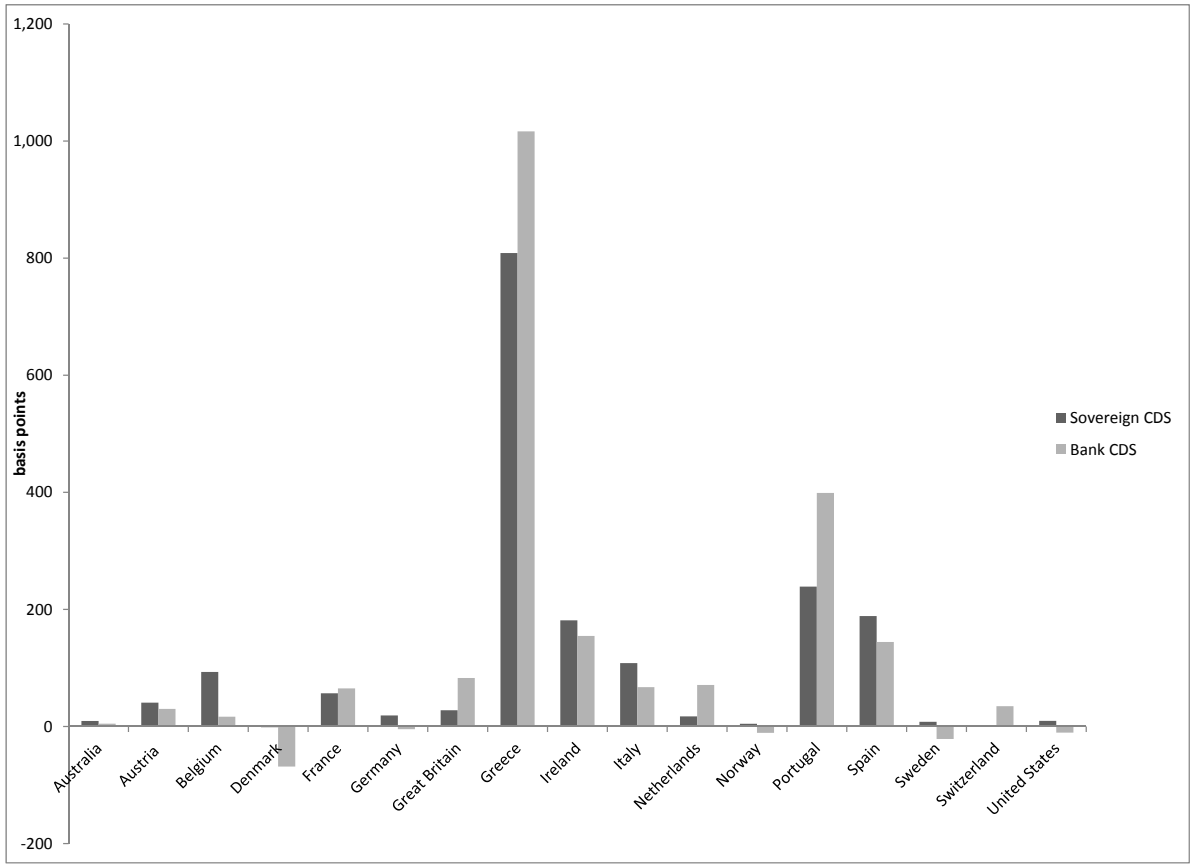
During the Bailout Period



9/27/2008 – 10/21/2008

- bank CDS decreases substantially
- strong increase in sovereign CDS

Post Bailout



10/22/2008 – 6/30/2010

- positive comovement
- a merger of financial sector and and sovereign?

This Paper

- Models trade-off between sovereign and financial sector credit risk
- Government can transfer resources to financial sector
  - Transfer alleviates under-provision of financial services (debt overhang)
  - Funding the transfer induces underinvestment in corporate sector and dilutes existing sovereign bondholders
- Solve government's problem and resulting sovereign bond price
- Empirical evidence from financial crisis of 2007 to 2011

Model

- Three dates: t = 0, 1, 2
- Sectors: Financial, Corporate, and Government

Financial sector:

$$\max_{s_0^s} E_0\left[\left(w_s s_0^s - L_1 + \tilde{A}_1 + A_G + T_0\right) \times 1_{\{-L_1+\tilde{A}_1+A_G+T_0>0\}}\right] - c(s_0^s)$$

1. Produces financial services s_0^s for per-unit wage w_s at cost of $c(s_0^s)$
   - an input to corporate sector production
   - revenue captured only if solvent at t=1 (otherwise goes to debtholders)

2. Incentive to produce depends on $p_{solv} = E_0\left[1_{\{-L_1+\tilde{A}_1+A_G+T_0>0\}}\right]$
   - crisis –> low p_{solv} (debt-overhang)–> under-provision of financial services
   - L_1 are liabilities due at t=1
   - $\tilde{A}_1$ uncertain payoff of assets at t=1
   - A_G a fraction k_A of outstanding sovereign debt
   - T_0 is value of govt transfer (bailout)

Corporate Sector

Corporate sector:

$$\max_{s_0^d,\, K_1} E_0\left[f(K_0, s_0^d) - w_s s_0^d + (1-\theta_0)\tilde{V}(K_1) - (K_1 - K_0)\right]$$

1. Buys s_0^d financial services to produce output $f(K_0, s_0^d)$ at t=1
2. Makes investment K_1 at t=1 in project with uncertain payoff $\tilde{V}(K_1)$ at t=2
   - $V(K_1) = E_0\left[\tilde{V}(K_1)\right] = K_1^\gamma,\ 0 < \gamma < 1$
3. Tax rate θ_0 set at $t = 0$ and levied at $t = 2$
   - funds existing govt debt and new transfer T_0
   - distorts incentive to invest $\rightarrow$ underinvestment:

$$\frac{dK_1}{d\theta_0} = \frac{V'(K_1)}{(1-\theta_0)V''(K_1)} < 0$$

Example: HP threatens to reduce investment in Ireland if taxes hiked to fund bailout (11/21)

- expected tax revenue $\mathcal{T} = \theta_0 V(K_1)$
- $\mathcal{T}$ rises in θ_0 then falls (Laffer curve)

The Government's Problem

1. Risk-Neutral representative consumer owns bonds and equity

$\Rightarrow$ Government's objective is to maximize expected total output

Uses Transfer (Bailout) to alleviate under-provision of financial services (debt-overhang)

2. Funds the Transfer and Existing Govt Debt with Taxes:
   - Existing Debt: N_D outstanding bonds with face value 1
   - Transfer: N_T new bonds issued $\rightarrow \quad T_0 = P_0 N_T$
   - Defaults if: $\theta_0 \tilde{V}(K_1) < N_D + N_T \Rightarrow$ deadweight loss of D

3. Govt chooses tax rate θ_0 and new bond issuance N_T to maximize total output:
   - subject to equilibrium conditions and price P_0
   - Insolvency ratio $\quad H = \dfrac{N_T + N_D}{\mathcal{T}} = \dfrac{N_T + N_D}{\theta_0 V(K_1)}$
   - rewrite using $\mathcal{T}$ and H instead of θ_0 and N_T

Under Certainty

Certain output: $\tilde{V}(K_1) = V(K_1)$

No default ($H = 1$):

1. As $L_1 \uparrow$ (more severe debt-overhang) $\Rightarrow \hat{T}$ (tax revenue) $\uparrow$ and $\hat{T}_0$ (transfer) $\uparrow$
2. As $N_D \uparrow$ (larger existing govt debt) $\Rightarrow \hat{T}$ (tax revenue) $\uparrow$ *but* $\hat{T}_0$ (transfer) $\downarrow$

Under a *strategic* default, it is optimal to fully dilute bondholders ($H \to \infty$)

- Captures full tax revenue by diluting existing bondholders to zero

$\Rightarrow$ greater T_0 ($\uparrow s_0$) with lower θ_0 ($\downarrow$ underinvestment)

- But suffer dead-weight loss D

$\Rightarrow$ Strategic Default is more attractive as $L_1 \uparrow$ and $N_D \uparrow$

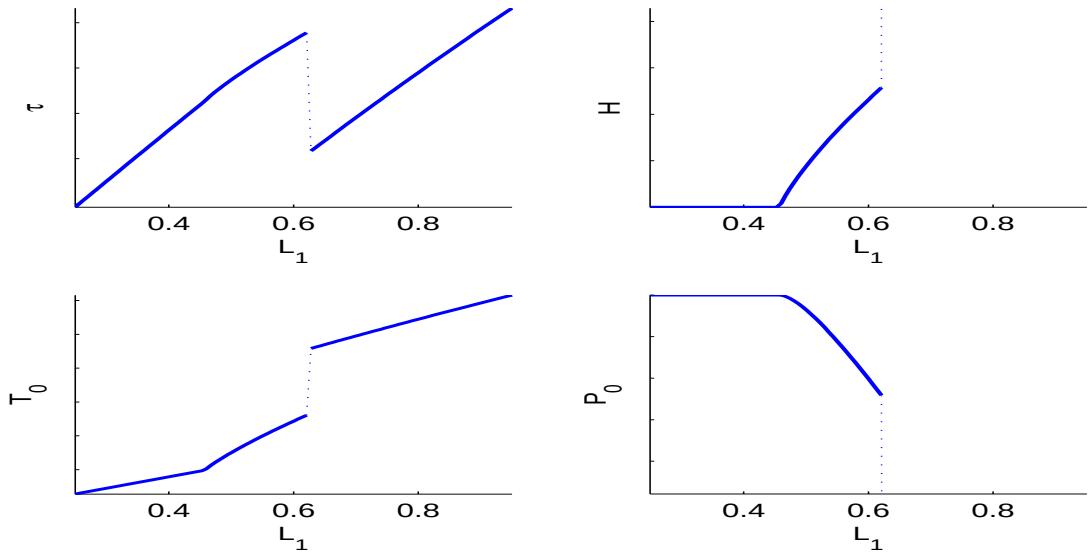
With Uncertainty

Uncertain output: $\tilde{V}(K_1) = V(K_1)\tilde{R}_V$

- Sovereign chooses H (insolvency ratio) on an interval, not just 1 or ∞

$\uparrow H \Rightarrow$ sovereign 'sacrificing' its creditworthiness to increase the bailout

- T_0 (bailout) $\uparrow$
- p_{def} (probability of sovereign default) $\uparrow$
- P_0 (govt bond price) $\downarrow$

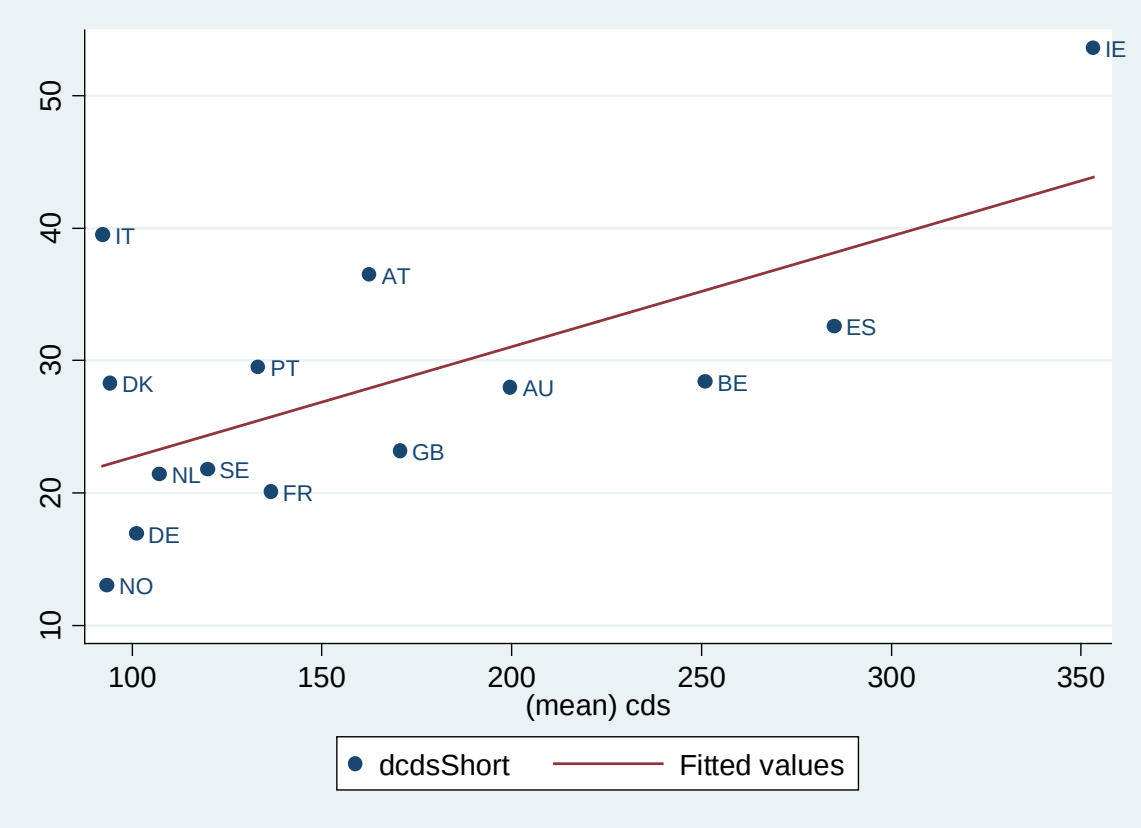


Empirical Implications I: Financial Sector → Sovereign

Fin sector crisis → severe debt-overhang (L_1) → Bailouts

1. Bailouts reduce bank credit risk, trigger increase in sovereign credit risk
2. *Spillover*: Pre-bailout financial sector distress predicts post-bailout increase in H (insolvency ratio) and sovereign CDS
3. Emergence of a positive relationship between the level of govt debt and sovereign credit risk (CDS)

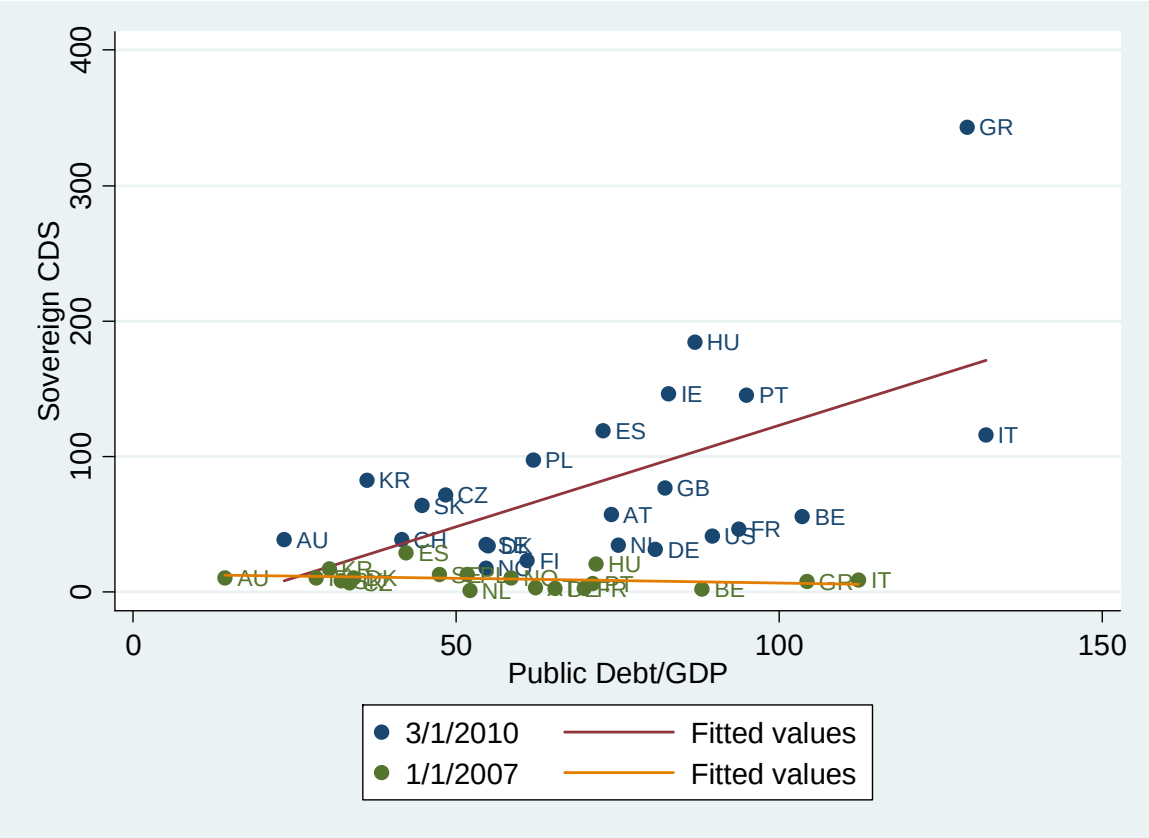
Spillover



Sov. CDS change vs. Pre-bailout Financial Sector Distress

- Financial Sector Distress: average bank CDS pre-bailout (21 Sep 2008)
- Sovereign CDS change: pre- to post-bailout

Emergence of Sovereign Credit Risk



Sov. CDS vs. Debt/GDP

- Pre-Bailouts: low-H region, not much relationship
- Post-Bailouts: sovereigns increase H, relationship becomes apparent

Spillover and the Emergence of Sovereign Risk

	Log (Sovereign CDS)			
	Pre-Bailout		Post-Bailout	
	(1)	(2)	(3)	(4)
Pre-bailout Gov't Debt (in %)	0.006	0.005	0.015*	0.013+
	(0.004)	(0.005)	(0.006)	(0.007)
Pre-bailout Fin. Sector Distress		0.311		0.965*
		(0.208)		(0.357)
Observations	15	14	17	15
R-squared	0.134	0.171	0.261	0.488

Pre-bailout debt-to-gdp and fin sector distress

- *strongly predict* post-bailout sovereign CDS, debt-to-gdp
- no relation pre-bailouts

Empirical Implications II: Sovereign → Financial Sector

Bailouts → emergence sovereign credit risk → affects bank credit risk

1. Increase in sovereign CDS raises Bank CDS
2. Empirical identification problem: unobserved third factor (e.g., gdp growth)
3. Examine co-movement of sovereign and bank CDS

$$\Delta \log(\text{Bank CDS}_{ijt}) = \alpha_i + \delta_t + \beta \Delta \log(\text{Sovereign CDS}_{jt}) + \gamma \Delta X_{ijt} + \varepsilon_{ijt}$$

X_{ij} control for

- Market-wide factors
- Time and bank fixed-effects
- Bank stock return

Market-Wide Controls and Time Fixed-Effects

	Δ Log(Bank CDS)					
	Pre-Bailout		Bailout		Post-Bailout	
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Log(Sovereign CDS)	0.017	0.003	0.448*	-1.293**	0.221**	0.163**
	(0.010)	(0.017)	(0.169)	(0.387)	(0.026)	(0.033)
Δ Log(CDS Market Index)	0.962**		0.893**		0.722**	
	(0.043)		(0.216)		(0.034)	
Δ Volatility Index	0.671**		-0.946**		0.057	
	(0.113)		(0.238)		(0.051)	
Week FE	N	Y	N	Y	N	Y
Interactions	N	Y	N	Y	N	Y
Observations	2,891	2,891	254	254	6,500	6,500
Banks	62	62	53	53	59	59
R-squared	0.262	0.476	0.114	0.599	0.338	0.479

- post-bailout: β is positive, very statistically significant
- around bailouts: β negative

Controlling Also For Bank Stock Returns

	Δ Log(Bank CDS)					
	Pre-Bailout		Bailout		Post-Bailout	
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Log(Sovereign CDS)	0.014	0.004	0.449**	-1.02	0.197**	0.146**
	(0.010)	(0.018)	(0.164)	(1.034)	(0.028)	(0.033)
Equity Return	-0.306*		-0.194		-0.145**	
	(0.142)		(0.185)		(0.030)	
Other Controls	Y	Y	Y	Y	Y	Y
Week FE	N	Y	N	Y	N	Y
Interactions	N	Y	N	Y	N	Y
Observations	2,891	2,891	254	254	6,500	6,500
Banks	62	62	53	53	59	59
R-squared	0.271	0.517	0.126	0.854	0.349	0.495

- sovereign CDS *still* very significant
- govt guarantees favor debt over equity → change in value of guarantee matters *even* after controlling for stock return

Conclusion

- Future costs of bailouts (e.g., moral hazard) are far from being the only important ones
- Costs are clear and present as bailouts have led to the emergence of sovereign credit risk
  - Gov. Budget constraint has tightened (gov. pockets are finite)– the elimination of slack is priced by the markets
- Resulting credit riskiness of sovereign debt feeds back onto financial sector
  - the ongoing banking crisis: impact of default risk in Greece, Ireland, Portugal, Italy
- Immediate stabilization of the financial sector by bailouts can be a Pyrrhic victory
  - the restructuring of financial sector debt should be considered more seriously

What if the Sovereign Cannot Do a Bailout? – Iceland vs. Ireland CDS