The Nexus Between Financial Sector and Sovereign Credit Risks: Theory and Evidence

Toulouse Lectures in Economics (forthcoming)

Viral V Acharya
(NYU Stern, CEPR and NBER)
Bank – Sovereign Credit Risk Loop

• First part, based on “A Pyrrhic Victory? Bank Bailouts and Sovereign Credit Risk” (with Itamar Drechsler and Philipp Schnabl, Journal of Finance, forthcoming)

• Sovereigns sacrifice credit quality to bail out the distressed financial sector
  – Financial sector credit risk → Sovereign credit risk

• (Further) Deterioration of sovereign credit risk weakens financial sector further
  – Sovereign credit risk → Financial sector credit risk
  – Direct collateral damage as well as weakened guarantees
Banks Gamble on Risky Sovereign Debt

• Second part, based on “The Greatest Carry Trade Ever? Understanding Eurozone Bank Risks” (with Sascha Steffen)

• Bailed-out or under-capitalized banks have incentives to gamble
  – Sovereign “sacrifice” makes government bonds an attractive gamble for out-of-money equity

• Banks fund sovereign debt in short-term funding markets for maximum “carry”
  – Bank solvency and liquidity risk deeply inter-twined
Government Myopia and Sovereign Debt

• Third part, based on “Sovereign Debt, Government Myopia and the Financial Sector” (with Raghuram Rajan, Review of Financial Studies)

• Why don’t governments limit the bank holdings of own debt?
  – Governments in fact encourage banks to do so

• Myopic nature of government borrowing for populist expenditures?
  – Ex-ante build up of nexus between banks and govts
Government Myopia and Under-capitalized Banks

- Based on "Why Are Banks Not Recapitalized During Crises? A Political Economy Explanation" (Matteo Crosignani, 2014)
- Highly levered banks risk-shift buying *domestic* government bonds
- Governments face a trade-off when setting capital requirements
  - Undercapitalized banks cut private lending and buy *domestic* government bonds
  - Well capitalized banks foster growth lending more to firms
- Myopic govts keep domestic banks undercapitalized to induce them to act as buyers of last resort
Does This Matter in Macro Finance?

• What are the “macro” facts about financial sector and crises?
• View 1:
  – Banks face tight market discipline ("solvency constraint")
  – Banks de-leverage in wake of adverse shocks
  – The real problem of crises is this de-leveraging
  – Banks hold safe assets in crises and shun risky ones
  – Public finance and bank regulations are in terms of importance second-order effects
Does This Matter in Macro Finance?

• What are the “macro” facts about financial sector and crises?

• View 2:
  – Banks do not face adequate market discipline (“too big to fail”, “too many to fail”, “too systemic to fail”...)
  – Banks continue as Zombies in the wake of crises
  – The real problem of crises is the persistent debt overhang or under-capitalization
  – Banks hold (legacy) risky assets and shun safer assets
  – Public finance and bank regulations are intimately tied to bank choices in good times
Some Open (Rhetorical!) Questions

• Do we want to fit macro-finance models and their insights to data that come from a world with bank regulation, bank bailouts and exploding public finance?

• Can we meaningfully calibrate macro-finance models to recent crises without any role for public finance in housing, the epicenter of crises?

• Are macro-finance models “wrong” in their economic foundations so that they remain tractable and calibration-friendly?

• Do we need a different set of micro-foundations for macro-finance going forward?
A Pyrrhic Victory? Bank Bailouts and Sovereign Credit Risk

Viral V Acharya
(NYU Stern, CEPR and NBER)

Itamar Drechsler
(NYU Stern and NBER)

Philipp Schnabl
(NYU Stern, CEPR and NBER)
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, Italy(!)
Motivation:
Bailout of Irish Banks
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

Viral Acharya, Itamar Drechsler and Philipp Schnabl
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
  1. Under certainty about future output and no-default
  2. Allowing for strategic default
  3. Under uncertainty about future output

- Empirical evidence from financial crisis of 2007 to 2010
The Government’s Problem

1. Risk-Neutral representative consumer owns bonds and equity

⇒ 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 $\Rightarrow T_0 = P_0 N_T$
   - Defaults if: $\theta_0 \tilde{V}(K_1) < N_D + N_T \Rightarrow$ deadweight loss of $D$

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

1. Under strategic default, optimal to set $N_T \rightarrow \infty (H \rightarrow \infty)$
2. Captures full tax revenue by diluting existing bondholders to zero
   $\Rightarrow$ greater $T_0 (\uparrow s_0)$ with lower $\theta_0 (\downarrow$ underinvestment)
3. But suffer dead-weight loss $D$

- $k_A$ (fin sector sovereign holdings) $[-] \rightarrow$ ‘collateral damage’
Comparative Statics for Debt Overhang ($L_1$)

- $\mathcal{T}$ (expected tax revenue) increases in $L_1$
- High $L_1$ (‘crisis’) $\rightarrow H$ ↑ (spillover, emergence of sovereign credit risk)
- $H$ ↑ increases $T_0$ while $P_0$ ↓
  - dotted line shows when total default becomes optimal
  - default allows for larger $T_0$ with smaller $\mathcal{T}$
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)
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
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
3-month moving average of $\beta$ estimates and 95% confidence interval
### Controlling Also For Bank Stock Returns

<table>
<thead>
<tr>
<th></th>
<th>Pre-Bailout</th>
<th>Δ Log(Bank CDS)</th>
<th>Bailout</th>
<th>Post-Bailout</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>Δ Log(Sovereign CDS)</td>
<td>0.014</td>
<td>0.004</td>
<td>0.449**</td>
<td>-1.02</td>
</tr>
<tr>
<td></td>
<td>(0.010)</td>
<td>(0.018)</td>
<td>(0.164)</td>
<td>(1.034)</td>
</tr>
<tr>
<td>Equity Return</td>
<td>-0.306*</td>
<td>-0.194</td>
<td></td>
<td>-0.145**</td>
</tr>
<tr>
<td></td>
<td>(0.142)</td>
<td>(0.185)</td>
<td></td>
<td>(0.030)</td>
</tr>
</tbody>
</table>

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
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.
The “Greatest” Carry Trade Ever?
Understanding Eurozone Bank Risks

Viral V. Acharya (NYU Stern)

and

Sascha Steffen (ESMT)
Motivation

- The European banking system is highly interconnected with the health of the sovereigns through the holdings of their debt

- Domestic as well as cross-country holdings of sovereign debt.

- Over the past decade, similar yields across European sovereigns implied that European institutions, the IMF and other member states were assumed to stand ready to support troubled member countries.

- Since mid-2008, government bond yield spreads between pairs of European countries have widened considerably, mirroring the economic divergence between these countries.
Figure 1.B. Pairwise Comparison of Government Bond Yield Spreads: Spain versus Germany

This graphic shows the time series of 10-year government bond yields comparing Spanish and German 10-year government bond yields since January 2005 (Source: Bloomberg).
Figure 3 US MMF Withdrawals

This figure depicts the investments of US MMF in European banks since October 2010.

Sale of commercial paper and repurchase agreements of European banks during the January to December 2011 period.
“Carry Trades“ in Peripheral Sovereign Bonds

- (Our results suggest that) Bank risk in this period can be understood as reflecting a “carry trade“ behavior
  - Financing leg: short-term wholesale market
  - Investment leg: long-term GIPSI government bonds

- Carry trade reflects a bet on the economic convergence of the Eurozone and a convergence of the spread between the two legs
  - Banks gain on the *upside* when yields of GIPSI countries decrease (and market prices increase), i.e. banks can pocket the “carry”
  - Bank lose on the *downside* when spreads between both legs diverge further
    • Leading to losses of banks on sovereign bond portfolio
    • Questioning solvency and/or liquidity of banks in funding markets
Main Hypothesis

➢ European banks search for yield through investments in high yielding risky sovereign debt financed with short-term funding.

➢ Current regulatory capital requirements in fact incentivizes such behavior by treating most sovereign bonds as safe and ignoring short-term funding.

➢ Basel II assigns zero risk weights for holding sovereign debt increasing incentives for under-capitalized banks to shift their portfolios into those assets ("regulatory arbitrage").

➢ Moreover, under-capitalized banks have an incentive to shift into riskier assets holding risk weights constant ("risk shifting").

➢ European banks can use securities to obtain funding from the ECB.
Table 2. Summary Statistics of Factor Loadings and Bond Holdings (cont’d)

Panel D. Sovereign bond holdings (in million euros)

<table>
<thead>
<tr>
<th></th>
<th>Greece</th>
<th>Italy</th>
<th>Portugal</th>
<th>Spain</th>
<th>Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No GIPSI banks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>March 2010</td>
<td>34,814</td>
<td>115,472</td>
<td>14,776</td>
<td>29,190</td>
<td>18,677</td>
</tr>
<tr>
<td>December 2010</td>
<td>28,208</td>
<td>132,803</td>
<td>14,636</td>
<td>41,923</td>
<td>5,017</td>
</tr>
<tr>
<td>September 2011</td>
<td>21,832</td>
<td>103,137</td>
<td>13,975</td>
<td>30,039</td>
<td>3,845</td>
</tr>
<tr>
<td>December 2011</td>
<td>17,355</td>
<td>69,243</td>
<td>10,390</td>
<td>22,311</td>
<td>3,528</td>
</tr>
<tr>
<td>June 2012</td>
<td>1,672</td>
<td>69,344</td>
<td>10,169</td>
<td>20,615</td>
<td>2,961</td>
</tr>
<tr>
<td><strong>GIPSI banks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>March 2010</td>
<td>56,148</td>
<td>144,856</td>
<td>5,176</td>
<td>143,869</td>
<td>5,322</td>
</tr>
<tr>
<td>December 2010</td>
<td>54,447</td>
<td>164,011</td>
<td>10,351</td>
<td>154,793</td>
<td>12,466</td>
</tr>
<tr>
<td>September 2011</td>
<td>NA</td>
<td>156,043</td>
<td>10,972</td>
<td>143,629</td>
<td>12,455</td>
</tr>
<tr>
<td>December 2011</td>
<td>NA</td>
<td>147,746</td>
<td>8,180</td>
<td>111,774</td>
<td>12,109</td>
</tr>
<tr>
<td>June 2012</td>
<td>NA</td>
<td>184,171</td>
<td>10,657</td>
<td>124,385</td>
<td>13,848</td>
</tr>
</tbody>
</table>

- GIPSI and non-GIPSI banks increased their exposure to Italy and Spain between March 2010 and December 2010.

- GIPSI banks increase holdings of Italian and Spanish government debt after LTROs.
Table 3A. Increasing Sovereign Exposure: Bank Level Evidence

<table>
<thead>
<tr>
<th>By Country (Changes in holdings in million euros)</th>
<th>Italian Bank</th>
<th>Spanish Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \Delta ) Italy March 2010- Dec 2010</td>
<td>( \Delta ) Spain March 2010- Dec 2010</td>
</tr>
<tr>
<td></td>
<td>( \Delta ) Italy Dec 2011 - June 2012</td>
<td>( \Delta ) Spain Dec 2011 - June 2012</td>
</tr>
<tr>
<td>% Change (2010)</td>
<td>% Change (2012)</td>
<td></td>
</tr>
<tr>
<td>% Change (2010)</td>
<td>% Change (2012)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>21,358 -589</td>
<td>19,155 36,424</td>
<td></td>
</tr>
<tr>
<td>19.26% -0.86%</td>
<td>13.22% 24.65%</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>16,762 -1,758</td>
<td>5,335 12,611</td>
<td></td>
</tr>
<tr>
<td>66.34% -7.69%</td>
<td>3.71% 11.28%</td>
<td></td>
</tr>
</tbody>
</table>

- Banks were not *passively* caught by the sovereign debt crisis as suggested by the inertia hypothesis but *actively* increased their sovereign debt positions.

- It was not domestic banks that increased their exposures as suggested by the home bias hypothesis but non-peripheral banks.
Table 3B. Increasing Sovereign Exposure: Bank Level Evidence

<table>
<thead>
<tr>
<th>By Bank Risk (Holdings scaled by Total Assets)</th>
<th>Δ Italy March 2010-Dec 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Tier 1</td>
<td>0.022</td>
</tr>
<tr>
<td>Low Tier 1</td>
<td>0.491</td>
</tr>
<tr>
<td>High RWA/Assets</td>
<td>0.696</td>
</tr>
<tr>
<td>Low RWA/Assets</td>
<td>0.004</td>
</tr>
<tr>
<td>High Loans/Assets</td>
<td>0.387</td>
</tr>
<tr>
<td>Low Loans/Assets</td>
<td>-0.022</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Δ Spain March 2010-Dec 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Tier 1</td>
</tr>
<tr>
<td>Low Tier 1</td>
</tr>
<tr>
<td>High RWA/Assets</td>
</tr>
<tr>
<td>Low RWA/Assets</td>
</tr>
<tr>
<td>High Loans/Assets</td>
</tr>
<tr>
<td>Low Loans/Assets</td>
</tr>
</tbody>
</table>

- For example, banks with a Tier-1 ratio below 9.03% (the 25% quartile) increase their Italian bond holdings, on average, by 0.49% of total assets between March and December 2010.

- Banks with low Tier 1 ratios, high RWA / Assets and high Loans / Assets increase their exposure to Italian and Spanish sovereign debt.
Increase in Home Bias After ECB Dec‘11 and Feb‘12 LTROs

- The exposure of core European banks to Italian and Spanish sovereign debt decreased over the March 2010 to June 2012 period.

- The exposure of peripheral banks to their domestic sovereign debt increased over the same period.

<table>
<thead>
<tr>
<th>Italian Bank</th>
<th>% Change (2010)</th>
<th>% Change (2012)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>19.26%</td>
<td>-0.86%</td>
</tr>
<tr>
<td>Yes</td>
<td>13.22%</td>
<td>24.65%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
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<td>-7.69%</td>
</tr>
<tr>
<td>Yes</td>
<td>3.71%</td>
<td>11.28%</td>
</tr>
</tbody>
</table>

- Results indicate an increase in ‘home bias’ over time financed with Dec’11 and Feb’12 LTROs from the ECB
  - Suggesting that the ECB helps to contain risks within the periphery
Table 3C. Home Bias and LTROs

This table shows changes in Italian / Spanish sovereign bond holdings between Dec’11 and June’12 (in million euros).

<table>
<thead>
<tr>
<th></th>
<th>Italy</th>
<th>Spain</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;= 3 years</td>
<td>&gt; 3 years</td>
<td>&lt;= 3 years</td>
<td>&gt; 3 years</td>
</tr>
<tr>
<td>AT</td>
<td>-473</td>
<td>-4</td>
<td>-100</td>
<td>1</td>
</tr>
<tr>
<td>BE</td>
<td>-137</td>
<td>-232</td>
<td>-814</td>
<td>-189</td>
</tr>
<tr>
<td>CY</td>
<td>30</td>
<td>-27</td>
<td>0</td>
<td>-5</td>
</tr>
<tr>
<td>DE</td>
<td>-48</td>
<td>767</td>
<td>56</td>
<td>-588</td>
</tr>
<tr>
<td>DK</td>
<td>158</td>
<td>151</td>
<td>-31</td>
<td>8</td>
</tr>
<tr>
<td>ES</td>
<td>1,531</td>
<td>-2,450</td>
<td>6,032</td>
<td>6,579</td>
</tr>
<tr>
<td>FR</td>
<td>4,009</td>
<td>-881</td>
<td>345</td>
<td>231</td>
</tr>
<tr>
<td>GB</td>
<td>-1,468</td>
<td>-1,791</td>
<td>-956</td>
<td>528</td>
</tr>
<tr>
<td>HU</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>IE</td>
<td>1</td>
<td>15</td>
<td>-30</td>
<td>0</td>
</tr>
<tr>
<td>IT</td>
<td>28,643</td>
<td>7,782</td>
<td>-65</td>
<td>-271</td>
</tr>
<tr>
<td>MT</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>NL</td>
<td>230</td>
<td>-187</td>
<td>-319</td>
<td>142</td>
</tr>
<tr>
<td>NO</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>PT</td>
<td>-1</td>
<td>65</td>
<td>-19</td>
<td>27</td>
</tr>
<tr>
<td>SE</td>
<td>11</td>
<td>-6</td>
<td>-13</td>
<td>0</td>
</tr>
</tbody>
</table>

- Banks match the maturities of the securities they purchase with the maturity of ECB funds.
- Particularly domestic banks are net purchasers of Italian/Spanish bonds.
Sovereign debt, government myopia and the financial sector

Viral V Acharya
(NYU Stern, CEPR and NBER)
and
Raghuram G Rajan
(Chicago Booth and NBER)
Why do governments repay sovereign borrowing?

• Fear of exclusion from debt markets, sanctions
  – Eaton-Gersovitz (1981), Bulow-Rogoff (1989), ...

• But defaulters return to international capital markets reasonably soon after default
  – Eichengreen (1987), Arellano (2009), ...

• Governments issuing debt in own currency face “collateral damage” to their banks
  – Broner-Martin-Ventura (2010), Bolton-Jeanne (2011),
    Gennaioli-Martin-Rossi (2011), ...
  – More applicable to rich, industrialized countries
Our Explanation

• Most governments care about short-term electoral popularity and like to “spend”
  – Hence, they care about *current cash flows*
• They dislike default as it lowers current cash
• They pass on the burden of repaying debt to future governments
  – Collateral damage channel, even if less relevant now, may be stronger then
• Current governments “stuff” their banks with bonds to build *future* commitment to repay
  – And knowing this, creditors continue to lend