

Avoiding the Fall into the Loop: Isolating the Transmission of Bank-to-Sovereign Distress in the Euro Area and its Drivers

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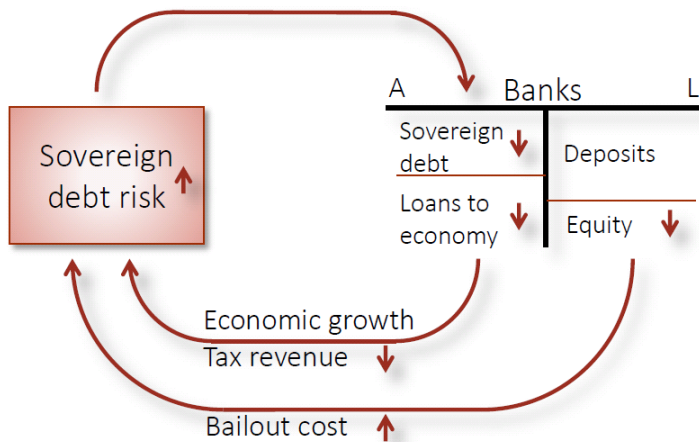


Figure: Sovereign-Bank Loop in Brunnermeier et al. (2016)

Bailout Channel

- With the beginning of Euro Crisis: bank risks start amplifying sovereign risks
Acharya et al. (2014), Alter & Schüller (2012)
- Prime example: Ireland's 32.1% budget deficit in 2010 used to bail out its ailing banking sector

Sovereign Bonds Channel

- Banks holding a larger exposure of (impaired) sovereign debt are more risky and reduce credit supply to firms
Altavilla et al. (2016), Popov, Van Horen (2015), Acharya et al. (2016)

Sovereign-Bank Loop still matters

- European Commission (October 2017):
[A] Europe-wide deposit guarantee (...) would help break the bank-sovereign link.
- European Commission (May 2018):
For banks, SBBS would contribute to further weakening the link between banks and their governments.
- Home bias in banks' sovereign bond holdings
- Banking regulation and zero risk weight for sovereign bonds

However, the previous identification of the loop can be cause for concern

- Typical equation in the literature:

$$\Delta \log(BankCDS_{ijt}) = \alpha_i + \delta_t + \beta \Delta \log(SovereignCDS_{jt}) + \gamma_i \Delta X_{ijt} + \varepsilon_{ijt}$$

Acharya et al. (2014) but similar in Schnabel & Schüwer (2016), Altavilla et al. (2016), Singh et al. (2016), Erce (2015)

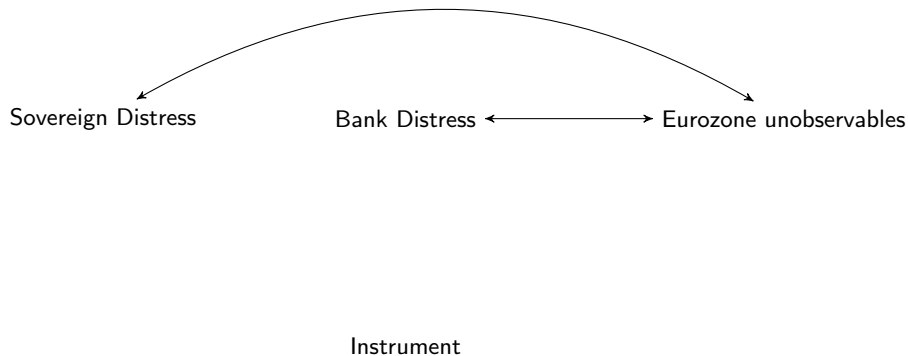
- Reverse Causality: mutual feedback effects between bank and sovereign distress lead to an upward-biased estimate of the respective parameters
 - Omitted Variables: break-up risk of Euro Area, political credibility of rescue packages, Eurozone-specific institutions...
 - β is unlikely to yield a causal effect of sovereign-to-bank (or bank-to-sovereign) distress and could be biased and/or inconsistent
- Given the difficulty of clearly identifying the transmission of distress in the loop, it remains uncertain which macroeconomic factors drive the bank-sovereign relationship

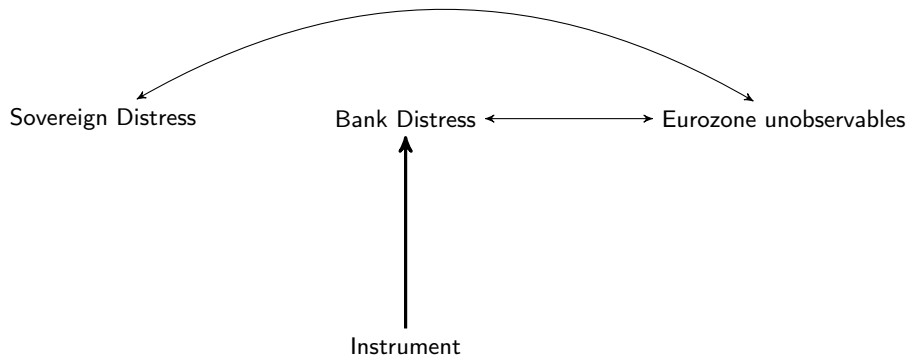
Our contribution:

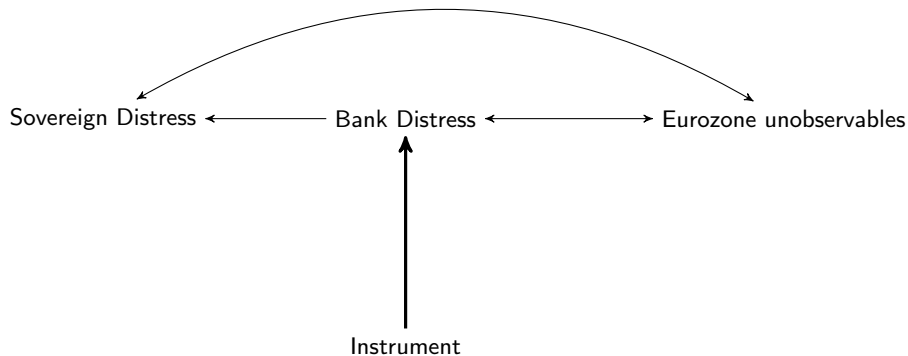
- Identify transmissions of bank-to-sovereign distress using an instrument that takes omitted variable bias and reverse causality within sovereign-bank nexus into account
- Uncover the macroeconomic and financial drivers of the distress channel from banks to sovereigns

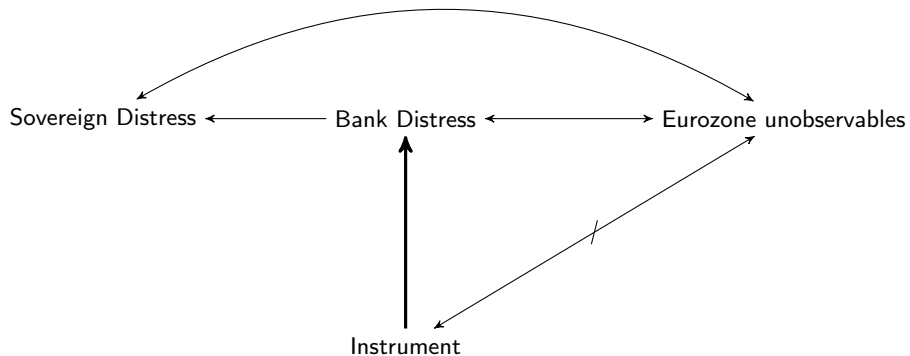
$$\Delta SovereignDistress_{it} = \beta_0 + \beta_1 \Delta NationalBankDistress_{it} + \beta_x \Delta Controls_{(i)t} + \gamma_i + \gamma_t + \epsilon_{it} \quad (1)$$

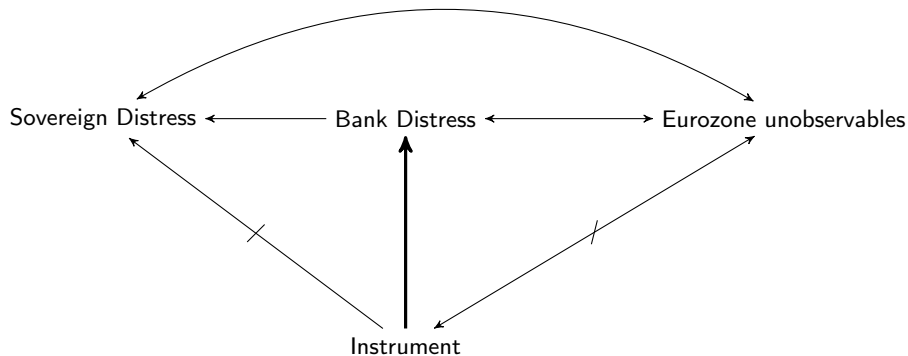
- Observation period: 01/01/2009 - 31/12/2016
- Sovereign Distress:
 - Increase in 10-year sovereign bond return spread of an EMU-country towards Germany
- National Bank Distress:
 - Collect daily stock returns and asset sizes of 121 listed banks in 10 major countries of the Eurozone
 - Weight stock return of each bank with asset share of the bank on country level; aggregate to country index ($BankDistress_{it}$)
 - Do same procedure for asset share on Eurozone level ($EurozoneBankDistress_t$)
 - $NationalBankDistress_{it} = BankDistress_{it} - EurozoneBankDistress_t$
- Controls:
 - Global: VIX, US corporate spread, US term spread
 - European: VSTOXX, nominal Euro exchange rate, Eurozone term spread, Itraxx non-financial, current account holdings
 - National: non-financial stock market returns
- γ_i : country fixed effects; γ_t : time fixed effects
- However: in the current form, β_1 will be biased and/or inconsistent











- Method: Use exposure-weighted stock returns of non-Eurozone countries
 - ⇒ We use the BIS claims of EMU country i 's banking sector against all borrowers of non-Eurozone country k in quarter q
 - ⇒ Claims towards one country are set relative to the total claims of i towards all non-EMU countries in order to derive a weighting factor:

$$Weight_{ikq} = \frac{BankClaim_{ikq}}{\sum_{k=1}^K BankClaim_{ikq}}$$

- ⇒ Multiply each weight of i towards k with the daily (t) stock market return series of k ($K=47$):

$$ExposureWeightedReturn_{ikt} = Weight_{ikq} * StockReturns_{kt}$$

- ⇒ Sum all weighted exposures of i over k to get $NonEMUStockReturns_{it}$
- ⇒ Represents (if negative) loan losses or asset write-downs in a banking sector's international exposure

- OLS:

$$\Delta SovereignDistress_{it} = \beta_0 + \beta_1 \Delta NationalBankDistress_{it} + \beta_x \Delta Controls_{(i)t} + \gamma_i + \gamma_t + \epsilon_{it}$$

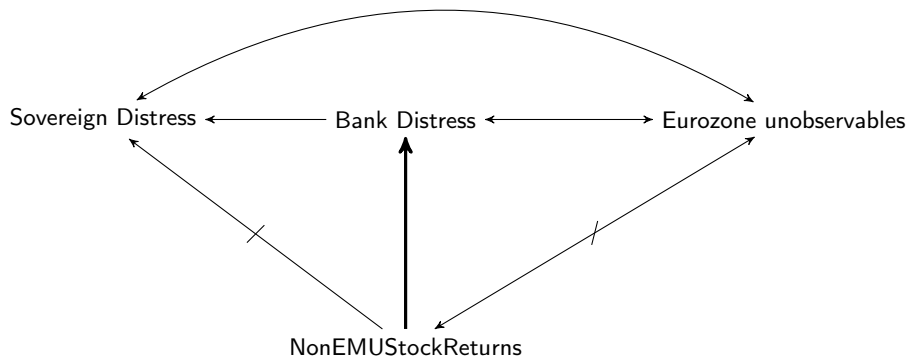
- 1st Stage IV:

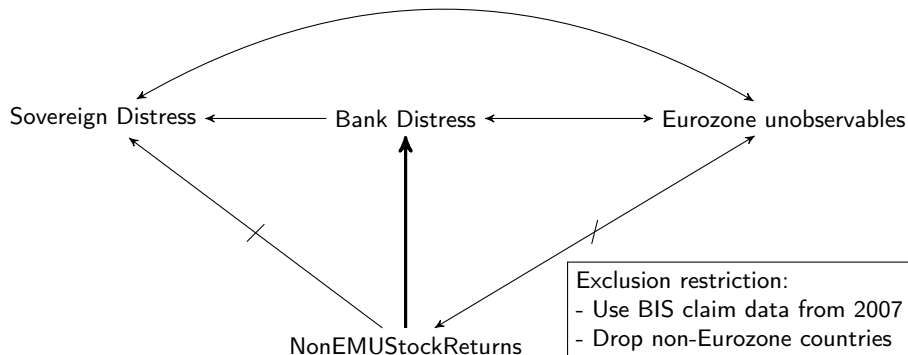
$$\Delta NationalBankDistress_{it} = \alpha_0 + \alpha_1 NonEMUStockReturns_{it} + \alpha_x \Delta Controls_{(i)t} + \gamma_i + \gamma_t + \epsilon_{it}$$

- 2nd Stage IV:

$$\Delta SovereignDistress_{it} = \delta_0 + \delta_1 \widehat{\Delta NationalBankDistress_{it}} + \delta_x \Delta Controls_{(i)t} + \gamma_i + \gamma_t + \epsilon_{it}$$

- ▶ National bank distress is identified through exposure-weighted, non-Eurozone stock market shocks
- ▶ Still: Eurozone banking sectors could have shifted international exposure endogenously
- ▶ Non-Eurozone stock returns could feature Eurozone-specific component





Exclusion restriction:

- Use BIS claim data from 2007
- Drop non-Eurozone countries if excessive borrowers of resp. Eurozone country
- Remove the Eurozone-specific variation in global stock market returns via orthogonalization;

Table: Bank-Sovereign distress channel: OLS and instrumental variable

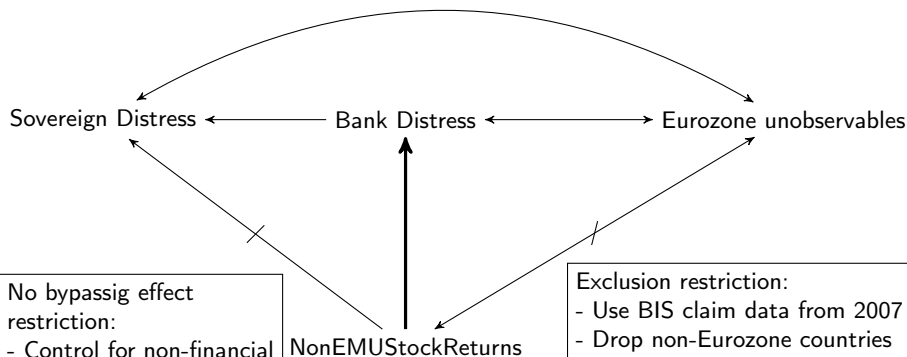
Specification	(1) OLS	(2) IV First Stage	(3) IV Second Stage
Dependent Variable	Δ Sovereign Distress	Δ NationalBank Distress	Δ Sovereign Distress
Δ NationalBankDistress	0.195*** (0.0502)		0.109*** (0.022)
Non-EMU Stock Returns:			
- 2007:Q1 BIS Claims		-0.427*** (0.0513)	
- excluding dependent Borrowers			
- eliminating EMU Component			
Observations	18,208	18,208	18,208
R-squared	0.176	0.296	
Number of Countries	9	9	9
Time & Country FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes

Table: Transmission of bank-sovereign distress: OLS and instrumental variable

Dependent Variable	OLS	IV-2SLS	
	(1) $\Delta \text{SovereignDistress}$	(2) $\Delta \text{NationalBankDistress}$	(3) $\Delta \text{SovereignDistress}$
$\Delta \text{NationalBankDistress}$	0.195*** (0.0502)		0.160*** (0.0273)
$\text{NonEMUStockReturns}$		-0.432*** (0.0407)	
ΔVIX	-0.0280*** (0.00414)	0.0274 (0.0166)	-0.0385*** (0.00491)
$\Delta \text{USCorporateSpread}$	0.0184* (0.00924)	0.0112* (0.00586)	0.0163* (0.00843)
$\Delta \text{USTermSpread}$	-0.106*** (0.0217)	-0.0298*** (0.00740)	-0.101*** (0.0201)
ΔVstox	0.152*** (0.0364)	0.0986*** (0.0250)	0.123*** (0.0336)
$\Delta \text{NominalExchangeRate}$	-0.129*** (0.0264)	0.0532 (0.0454)	-0.124*** (0.0224)
$\Delta \text{EurozoneTermSpread}$	0.125*** (0.0174)	0.0163** (0.00660)	0.122*** (0.0162)
$\Delta \text{NonFinancialItraxx}$	0.0194** (0.00724)	0.0318** (0.0119)	0.0105 (0.00951)
$\Delta \text{CurrentAccountHoldings}$	-0.0191** (0.00638)	-0.00933 (0.00529)	-0.0174*** (0.00618)
$\text{NonFinancialStockReturns}$	-0.123** (0.0390)	0.0178 (0.115)	-0.126*** (0.0273)
Constant	-0.0272 (0.0304)	0.0848* (0.0454)	
Observations	18,208	18,208	18,208
R-squared	0.176	0.301	
Number of Countries	9	9	9
Time & Country FE	Yes	Yes	Yes

Implications

- Instrument is strong in first stage, F-statistic at 69.13
- Bank Distress IV coefficient decreases with each layer of adjustment (not shown)
- Bank Distress OLS coefficient is roughly 80% larger and thereby statistically significantly different than the second stage IV coefficient
- ▶ Reverse causality and other endogeneity issues likely play a role when estimating the sovereign-bank-loop
- Still: an increase of one std. deviation of instrumented bank distress of a Eurozone country leads to a rise in sovereign distress by 0.109 std. deviations on average
- ▶ Banking sector distress was therefore likely a dominant cause for the severity of the Eurozone crisis



No bypassing effect restriction:

- Control for non-financial stock market returns and effective Euro exchange rate
- Use *NonEMU Bank Stock Returns*
- Control for trade shocks

Exclusion restriction:

- Use BIS claim data from 2007
- Drop non-Eurozone countries if excessive borrowers of resp. Eurozone country
- Remove the Eurozone-specific variation in global stock market returns via orthogonalization;

Robustness

- Sovereign CDS spreads instead of bond returns spreads as dependent variable
- Using country bank risks without removing Eurozone component as endogenous variable
- Different orthogonalization procedure of EMU-specific component
- Remove non-Euro EU countries instead of credit-dependent countries
- Starting in 2010:Q2
- Weekly instead of daily frequency
- ICB instead of URB data by BIS
- Instrument in Euro instead of US Dollar
- Monthly instead of quarterly fixed effects

Current Revise

- Longer estimation period (since Euro introduction)
- Stronger focus on criteria to select excessive non-EMU borrowers
- Considering reverse case: non-EMU banks holding EMU sovereign bonds
- Reconsider section on drivers of bank distress

We hypothesize that the transmission of bank-to-sovereign distress is stronger for countries with:

- weaker macroeconomic performance
- larger movements in their market for sovereign bonds
- impaired banking sectors and weaker financial regulation
- elevated political risks

We estimate:

$$\Delta SovereignDistress_{it} = \lambda_1 \Delta \widehat{NationalBankDistress}_{it} * Channel_{it-1} + \lambda_2 Channel_{it-1} + \lambda_3 \Delta \widehat{NationalBankDistress}_{it} + \lambda_x \Delta Controls_{(i)t} + \alpha_i + \delta_t + \epsilon_{it} \quad (2)$$

Macroeconomic Performance:

- Distress channel turns insignificant at:
 - debt-to-GDP ratio of under 80%
 - fiscal deficit under -2% of GDP
 - quarterly GDP growth of 1%
 - unemployment ratio under 8%
 - current account ratio over 3%.

Bond Issuance:

- No significant effects for months in which governments have to repay or issue more government securities
- Significantly stronger distress transmission for larger “home bias” in government bond holdings

Banking Sector Stability:

- Distress channel turns insignificant at:
 - Non-performing loans ratio of under 3%
 - Return-on-assets larger than 0.75%
 - Tier1 capital ratio larger than 16%
 - Lower funding of bank liabilities by central bank
 - Stronger macroprudential regulation
 - More developed bond markets

Political Risks:

- Stronger transmission in election periods and in times of higher political uncertainty

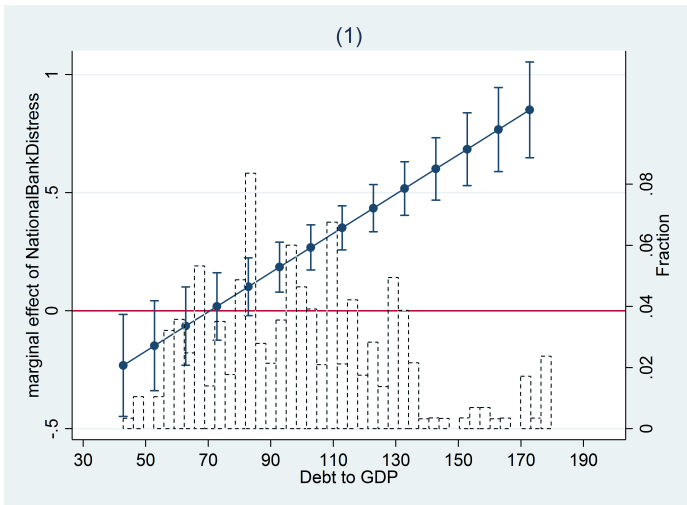


Figure: Marginal effect of instrumented bank distress on sovereign distress conditional on Debt-To-GDP

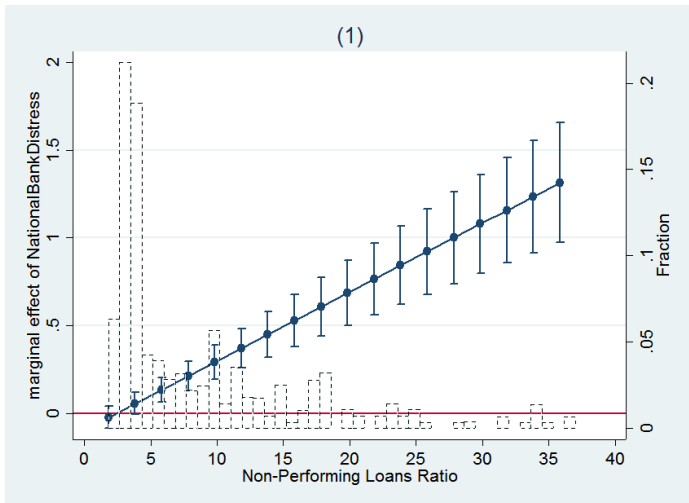


Figure: Marginal effect of instr. bank distress on sovereign distress conditional on NPL Ratio

Sovereign-Bank-Loop still matters

- OLS and IV estimations of sovereign-bank-loop yield significantly different coefficients
- ▶ Reverse causality and other endogeneity issues likely play a role
- Still: Banking sector distress was likely a dominant cause for the propagation of the Eurozone crisis, not just a byproduct or a correlation
- ▶ Implications for understanding (overall) roots of the Eurozone crisis
- Poorer macroeconomic performances, weaker financial sectors and financial regulation and periods of elevated political uncertainty are associated with a more forceful distress transfer
- ▶ Euro Area is still vulnerable to macroeconomic and financial shocks; stronger architecture and tougher financial regulation could potentially lower the spreading of financial distress

Bank and Sovereign Distress

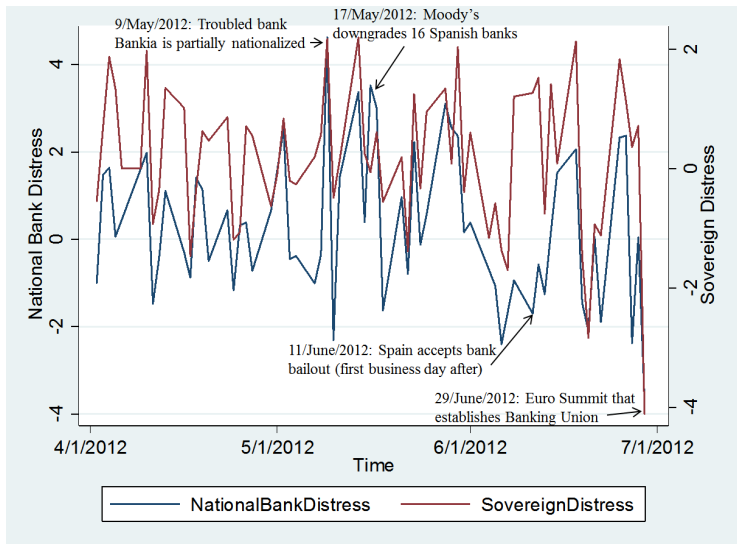


Figure: Bank and sovereign distress in Spain from April 1st 2012 to July 1st 2012

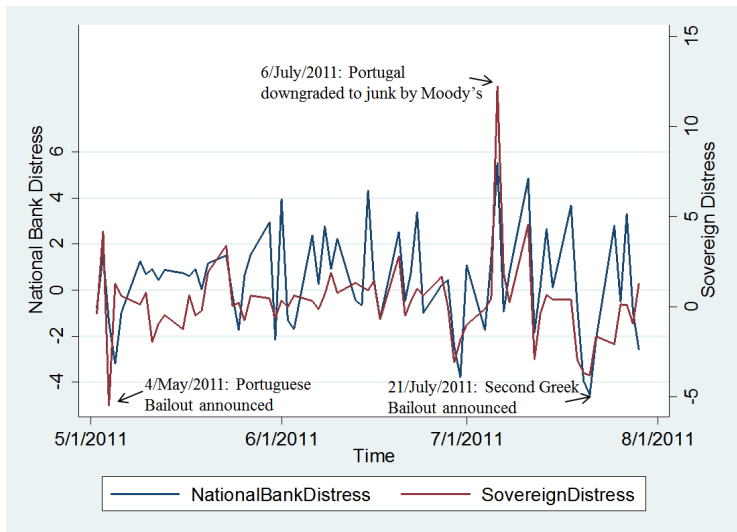


Figure: Bank and sovereign distress in Portugal from May 1st 2011 to August 1st 2011

Bank and Sovereign Distress

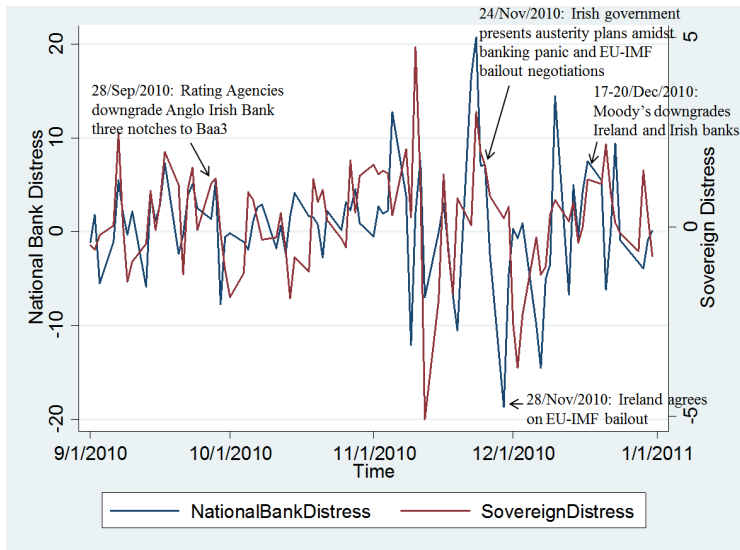


Figure: Bank and sovereign distress in Ireland from September 1st 2010 to January 1st 2011

Bank and Sovereign Distress

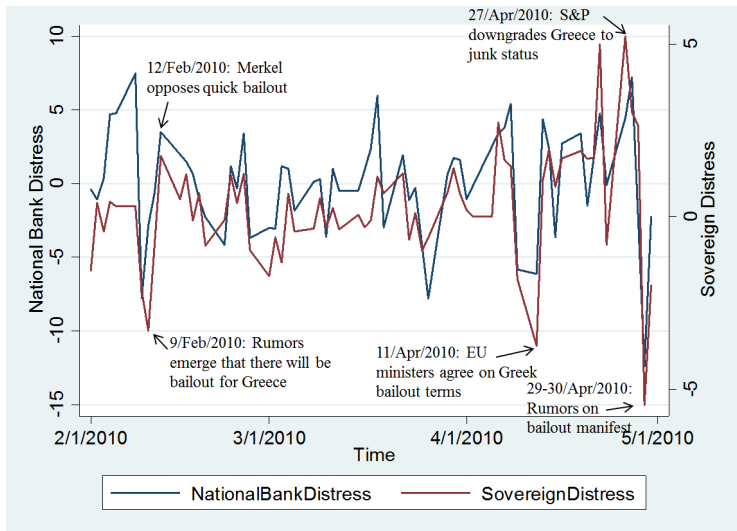


Figure: Bank and sovereign distress in Greece from February 1st 2010 to May 1st 2010

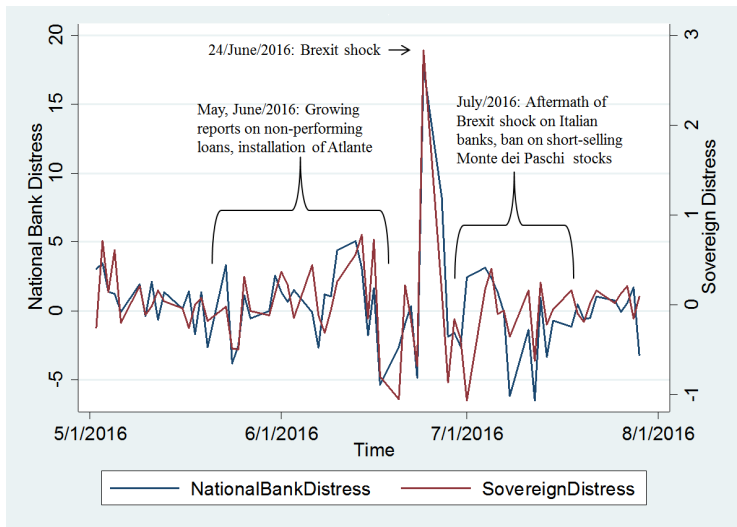


Figure: Bank and sovereign distress in Italy from May 1st 2016 to August 1st 2016

- Use $EurozoneBankDistress_t$ we created beforehand; (bank stock returns that are asset-weighted on Eurozone level)
- ▶ $EurozoneBankDistress_t$: *eurozone-specific* and *global* variation
- Use global bank return index (excluding EMU): *global* variation
- Orthogonalize $EurozoneBankDistress_t$ w.r.t. world bank return index
- ▶ $EurozoneBankDistressOrthogonalized_t$: *eurozone-specific* variation
- $Instrument_{i,t}$: (some) *eurozone-specific* and *global* variation
- Orthogonalize instrument w.r.t. $EurozoneDistressOrthogonalized_t$
- ▶ $InstrumentOrthogonalized_{i,t}$: *global* variation (*eurozone-specific* variation removed)