A New Measure for Gauging the Riskiness of European Banks' Sovereign Bond Portfolios

Abstract

For a sample of 51 European banks, during 2010-2016, we construct a novel measure (SovRisk) which captures the riskiness of sovereign bond portfolios. We demonstrate the ability of this measure to explain the phases of the European sovereign debt crisis, while accounting for the substantial differences among distressed and non-distressed countries. We contend that SovRisk can be used as complement to bank Credit Default Swap (CDS) spreads, or a substitute in the absence of traded CDS, for measuring banks' sovereign risk.

1. Introduction

The sovereign-bank nexus attracted widespread attention during the European sovereign debt crisis. The strong interconnection between bank and sovereign risk, especially for institutions operating in distressed euro area countries, renewed the focus on the prudential treatment of banks' sovereign bond holdings.[1] This was of policy importance for both financial stability and monetary policy concerns. Notable contributions (Acharya et al., 2014; Farhi and Tirole, 2017, among others) document the existence of multiple risk transmission channels feeding the two-way vicious loop between banks and sovereigns. Framed within the current debate on how to successfully reduce risk in European banking and complete the post-crisis reform agenda, an accurate appreciation of the inherent riskiness of banks' sovereign bond portfolios is of primary importance.

While an extensive strand of prior literature has focused on investigating the determinants of both size and risk of banks' sovereign debt exposures in Europe (Acharya and Steffen, 2015; Ongena et al., 2019), limited attention has been devoted to develop a measure to quantify the risk associated with these exposures. Previous empirical studies mostly employ CDS spreads to assess the riskiness of both sovereigns and banks and the associated sovereign-bank nexus in Europe (Acharya et al., 2014; Fratzscher and Rieth, 2019, among others). While spreads on CDS contracts have been widely used as proxies for default risk, a number of authoritative contributions (Annaert et al., 2013; Avino and Cotter, 2014; Fontana and Scheicher, 2016) underline significant challenges in using these indicators. In particular, during periods of significant distress CDS spreads tend to capture wider market dynamics and can fail to precisely identify bank riskiness.

In this paper, we create a novel and alternative indicator, SovRisk, which focuses on weighted country-by-country banks' sovereign bond exposures and links these with the specific risk profile of each selected country. Our measure consists of two key components that capture (i) a bank's exposure towards a specific sovereign and (ii) the actual risk of such exposure, is believed to mitigate the controversial effect of wider market dynamics, compared to CDS

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[1] The existing regulatory framework entails a preferential risk weight for sovereign exposures that are denominated and funded in local currency. Moreover, sovereign exposures are not subject to the limits applied for large exposures or to "haircuts" when they are eligible as high-quality liquid assets (HQLA) within regulatory liquidity standards (BIS, 2017).

spreads, while effectively measuring the overall riskiness of a bank's sovereign debt portfolio. Moreover, while CDS spreads are available mostly for large listed banks, by linking accounting to market-based information, SovRisk can be employed to investigate the sovereign risk exposure for a wider range of banks.[2] SovRisk can be used to gauge risks for all banks holding sovereign securities and that operate in countries for which information on government bond yields is available. In this paper, we use a publicly available and granular dataset from the European Banking Authority (EBA) and construct SovRisk for 51 banks from 19 European countries. We consider a time frame that covers both a distressed (namely, the European sovereign debt crisis, that started in late 2009) and a more tranquil period, following the ECB's intervention, in mid-2012, to prevent the collapse of the euro area.

We test the reliability of SovRisk in several ways. First, we test its capability to capture the different phases of sovereign default risk that characterised the European context over 2010-2016. Specifically, we explore whether banks located in stressed (Cyprus, Greece, Ireland, Italy, Portugal, Slovenia and Spain) and non-stressed countries, with heterogenous financial and fiscal conditions, present different risk exposures in their sovereign bond portfolios.[3] Second, we check whether the trend of SovRisk is similar to that of bank CDS spreads. Finally, in a regression-setting, we explore the relationship between SovRisk and both bank-specific and macroeconomic factors and compare the results to both the evidence for bank CDS spreads and prior literature on bank exposure to sovereign distress in Europe. Our findings demonstrate similar trends in SovRisk and bank CDS spreads, while also highlighting some differences in terms of the main determinants. As SovRisk can be used to quantify sovereign risk exposures for banks that do not have CDS it can be applied to a larger number of institutions. Also our SovRisk measure does not suffer from the aforementioned limitations of CDS quotes, as well as the limitations associated with the use of pure market and/or accounting-based measures (Das et al., 2009).

2. Empirical methodology and data

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[2] The use of bank CDS, as highlighted in different contributions in prior literature (Chiaramonte and Casu, 2013; Sclip et al., 2019, among others), has a major impact on sample size, given that only a limited number of relatively large banks have quoted CDS spreads.

[3] Stressed countries, compared to non-stressed countries, were perceived as having higher sovereign default and liquidity risks during the European sovereign debt crisis (Altavilla et al., 2017; Wei et al., 2018). European non-stressed countries are: Austria, Belgium, Denmark, Germany, Finland, France, Hungary, Luxembourg, Malta, Netherlands, Poland, Sweden and United Kingdom.

SovRisk for a bank i at time t is defined as follows:

$$SovRisk_{it} = \sum_{j=1}^{19} Spread_{jt} * Sovexpcountry_{ijt}$$

where:

$$Spread_{jt} = 1 + (10Y\ sovereign\ bond\ yield_{jt} - Benchmark_t)$$

and:

$$Sovexpcountry_{ijt} = Sovexp_{ijt}/Banktotass_{it}$$

$Spread_{jt}$ is the spread between the 10-year yield on a sovereign bond for a country j at time t and the 10-year German bund, as a benchmark. $Sovexpcountry_{jt}$ is the weighted sovereign exposure of bank i towards each country j at time t. The higher the value of $SovRisk$, the higher the risk of the corresponding bank sovereign bond portfolio.[4]

In a second stage of our analysis, we employ the System-Generalised Method of Moments (S-GMM) estimator, two-step procedure, in order to account for the potential endogeneity of the determinants of banks' sovereign bond holdings (Gennaioli et al., 2018; Affinito et al., 2019). The econometric equation is specified as follows:

$$Y_{it} = \alpha + \beta_0 Y_{it-1} + \beta_1 X_{it-1} + \beta_2 Z_{it} + \mu_t + \varepsilon_{it} \quad (1)$$

Y_{it} is our dependent variable (SovRisk or, alternatively, the logarithm of bank CDS spreads) for bank i at time t.[5] Y_{it-1} is the lagged value of the dependent variable, included to control for time persistence. Vector X comprises a set of lagged bank-specific variables, commonly employed in the banking literature (for example, Gennaioli et al., 2018; Affinito et al., 2019), as proxies for bank size (Size), loans outstanding (Lending), non-performing loans (NPLs), capitalisation (CET1), profitability (ROE), liquidity (Liquidity), business model orientation (Business model) and solvency (Z-score). Vector Z consists of exogenous country-level factors, such as short-term interest rates (STrate), the amount of sovereign debt (SovDebt) and GDP growth (GDP), able to influence banks' preference to purchase sovereign bonds. Year fixed-effects (μ_t) are included. Robust standard errors, corrected according to Windmeijer (2005), are clustered at the bank level.

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[4] The sample considered in this study consists of banks that were subject to either the EBA EU-wide stress tests or transparency exercises during 2010-2016. Table A1 in the Appendix reports the list of banks included in the sample.
[5] We employ bank 5Y senior CDS contracts collected from Datastream.

3. Empirical Results

Figure 1 shows the development of the average value of SovRisk, for the entire sample of banks, during 2010-2016. SovRisk effectively captures the different phases of the European sovereign debt crisis (the right hand side of Figure 1). It peaks during the most acute phase of the crisis, in 2012, driven by a contemporaneous increase in banks' amount and riskiness of sovereign bond holdings, and decreases thereafter. In addition, when splitting the sample between stressed and non-stressed European countries, SovRisk reveals a similar trend. However, its magnitude differs substantially during 2010-2016, with stressed banks holding larger and riskier amounts of sovereign debt compared to non-stressed banks.[6]

In order to provide further evidence on the reliability of our metric, we conduct a visual comparison of the trends for the average values of SovRisk and bank CDS spreads. The test is based on a restricted sample of 32 banks, depending on the availability and reliability of CDS price data (Figure 2).[7] During 2010-2014, inclusive of the most acute phase of the European sovereign debt crisis, the related trends appear to be similar for both the stressed and non-stressed sub-groups.[8]

The findings for the S-GMM, as displayed in Table 1, demonstrate similarities, but also differences, between the main determinants of SovRisk (column 1) and bank CDS spreads (column 2). Among the similarities, and in-line with prior literature on bank exposure to sovereign distress, our results highlight an inverse relationship between Size and SovRisk, statistically significant at the 1% level. Smaller banks tend to hold riskier sovereign bonds (Altavilla et al., 2017). In a similar fashion, the findings for bank CDS spreads suggest that larger banks are considered less risky by market participants.[9] Furthermore, banks with a lower level of NPLs are more prone to increase the riskiness of their sovereign bond holdings, likely because they are subject to less operational constraints and more inclined to "reach-for-yield".

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[6] T-test of mean differences indicates that SovRisk stressed and SovRisk non-stressed means are statistically different from zero at the 5% level.

[7] Potential issues in using CDS data are discussed in detail in Mayordomo et al. (2014).

[8] From 2015, for stressed banks, the trends start to diverge. We argue that the introduction of the EU Bank Recovery and Resolution Directive (BRRD), and associated bail-in mechanism, is likely to have played an important role in this evidence.

[9] This evidence could be driven by the fact that large banks are deemed "too-big-to-fail" (TBTF) and, therefore, more likely to benefit from implicit government guarantees in case of distress.

In terms of differences we document a negative and statistically significant (at the 5% level) relation between bank lending and SovRisk, while the corresponding finding for bank CDS spreads is insignificant (column 2). Samaniego-Medina et al. (2016) find a positive relationship between bank CDS spreads and bank lending. The authors argue that the portion of loans held in a bank's portfolio reflects its liquidity position. The higher the amount of loans, the less liquid the bank and, consequently, the higher CDS spreads. In contrast to this view, however, our result suggests that the asset structure of a bank affects its preference towards risky securities. In this respect, banks that either face lending constrains or limited demand for loans have an incentive to buy more risky sovereign debt in order to support their profitability (Acharya et al., 2015, Altavilla et al., 2017). Finally, among the macroeconomic variables, we find that banks located in countries with larger amounts of sovereign debt (to GDP) are more prone to hold riskier sovereign bonds. This evidence is likely to be driven by the greater "home-bias" of the sovereign bond portfolios of stressed banks. The coefficient on SovDebt (for the regression on bank CDS spreads in column 2) is not statistically significant suggesting that bank CDS spreads are not fully explained by increases in sovereign debt (Chiaramonte and Casu, 2013).

4. Conclusions

We construct a novel measure (SovRisk) to assess the riskiness of European banks' sovereign bond portfolios. We test its capability to capture the various phases of the European sovereign debt crisis, for both stressed and non-stressed banks. When compared with CDS spreads, we argue that SovRisk represents a reliable indicator of the banks' sovereign risk exposure, which can also be employed in the absence of traded bank CDS. Finally, we find the results of our dynamic panel data regression to be consistent with prior literature on banks' exposure to sovereign risk in Europe, as well as with the evidence for bank CDS spreads. We believe that SovRisk can effectively support supervisory authorities and researchers in assessing banks' exposure to sovereign risk. Moreover, our findings advance the debate on monitoring financial stability in European banking.

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Figure 1. Development of SovRisk, 2010-2016.
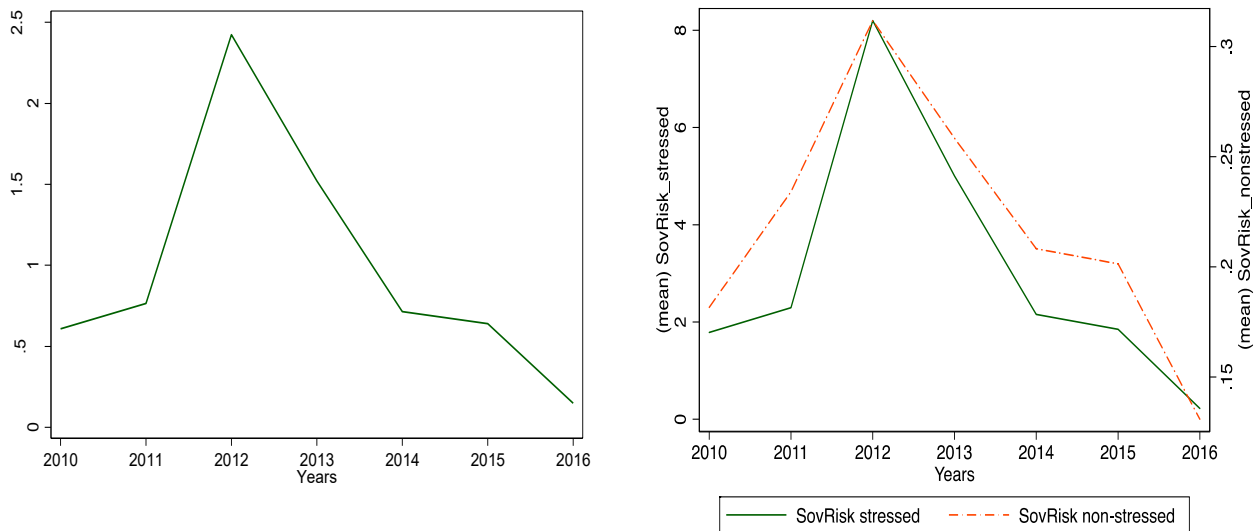
Note: On the left refers the average value of SovRisk for the whole sample, whilst on the right the average value of SovRisk for stressed (green line, left y axis) and non-stressed (dashed red line, right y axis) countries.

Figure 2. Development of SovRisk and bank CDS spreads, 2010-2016.
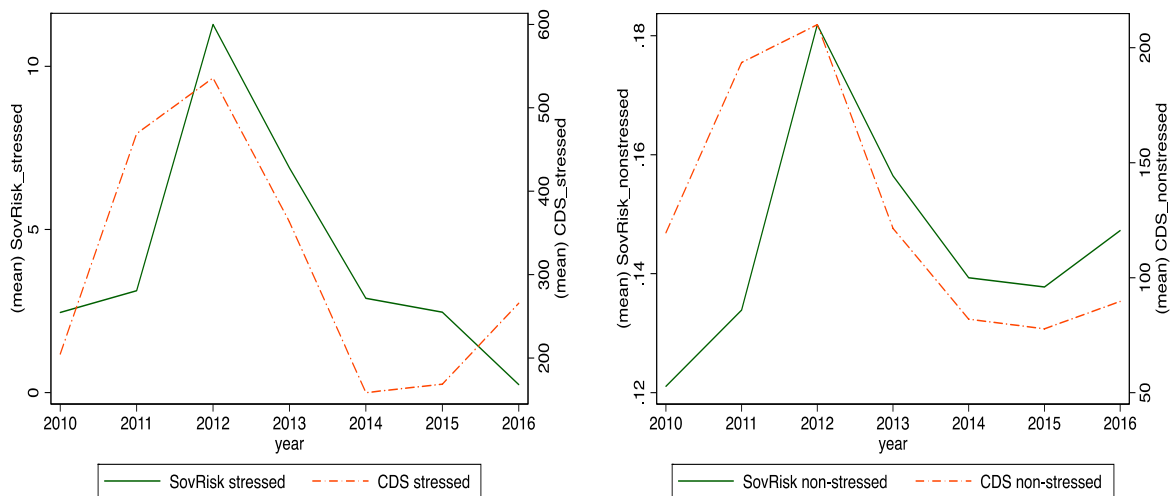
Note: On the left refers the average value of SovRisk (green line, left y axis) and bank CDS spreads (dashed red line, right y axis) for stressed countries, whilst on the right the average value of SovRisk (green line, left y axis) and bank CDS spreads (dashed red line, right y axis) for non-stressed countries.

Table 1. Riskiness of banks' sovereign bond portfolios (S-GMM), 2010-2016.

	(1) SovRisk	(2) Bank CDS spreads
SovRisk$_{t-1}$	0.2778***	
	(0.1242)	
Bank CDS spreads$_{t-1}$		0.6500**
		(0.0665)
Size$_{t-1}$	-0.0409***	-0.0577***
	(0.0098)	(0.0212)
Lending$_{t-1}$	-0.0016**	-0.0010
	(0.0007)	(0.0018)
NPLs$_{t-1}$	-0.0030***	-0.0089***
	(0.0009)	(0.0023)
CET1$_{t-1}$	-0.0337	-0.7907
	(0.4271)	(0.9457)
ROE$_{t-1}$	-0.0006	-0.0062**
	(0.0010)	(0.0010)
Liquidity$_{t-1}$	-0.0006	-0.0323
	(0.0020)	(0.0028)
Business model$_{t-1}$	-0.0005	0.0217***
	(0.0024)	(0.0083)
Z-score	-0.0002	-0.0099**
	(0.0031)	(0.0031)
STrate	0.0214	0.0210
	(0.0216)	(0.0499)
SovDebt	0.0028***	0.0001
	(0.0006)	(0.0007)
GDP	-0.0009	0.0005
	(0.0028)	(0.0036)
N. Obs.	304	192
N. Banks	51	32
AR2 Test	0.256	0.299
Hansen Test	0.135	0.167
N. Instruments	32	32
Year Fe	Yes	Yes

Note: Corrected robust standard errors are clustered at bank level and reported in parentheses. The p-values for the Arellano and Bond test for second order autocorrelation in the residuals (AR2), as well as the p-value for the Hansen J test are reported. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

Appendix

Table A1. Sample of banks

#	Bank	Country
1	Erste Group Bank AG	AT
2	KBC Groep NV/ KBC Groupe SA-KBC Group	BE
3	Bank of Cyprus Public Company Limited-Bank of Cyprus Group	CY
4	Bayerische Landesbank	DE
5	Commerzbank AG	DE
6	DekaBank Deutsche Girozentrale AG	DE
7	Deutsche Bank AG	DE
8	HSH Nordbank AG	DE
9	Hypo Real Estate Holding AG	DE
10	Landesbank Baden-Wuerttemberg	DE
11	Landesbank Hessen-Thueringen Girozentrale - HELABA	DE
12	Norddeutsche Landesbank Girozentrale NORD/LB	DE
13	Danske Bank A/S	DK
14	Jyske Bank A/S (Group)	DK
15	Nykredit Realkredit A/S	DK
16	Sydbank A/S	DK
17	Banco Bilbao Vizcaya Argentaria SA-BBVA	ES
18	Banco Popular Espanol SA	ES
19	Banco Santander SA	ES
20	OP Financial Group	FI
21	BNP Paribas	FR
22	BPCE SA	FR
23	Crédit Agricole S.A.	FR
24	Société Générale SA	FR
25	Barclays Bank Plc	GB
26	HSBC Holdings Plc	GB
27	Lloyds Banking Group Plc	GB
28	Royal Bank of Scotland Group Plc (The)	GB
29	OTP Bank Plc	HU
30	AIB Group PLC	IE
31	Bank of Ireland-Governor and Company of the Bank of Ireland	IE
32	Banca Monte dei Paschi di Siena SpA-Gruppo Monte dei Paschi di Siena	IT
33	Banco Popolare società cooperativa	IT
34	Intesa Sanpaolo	IT
35	UniCredit SpA	IT
36	Unione di Banche Italiane Scpa-UBI Banca	IT
37	Banque et Caisse d'Epargne de l'Etat Luxembourg	LU
38	Bank of Valletta Plc	MT
39	ABN AMRO Group N.V.	NL
40	ING Groep NV	NL
41	SNS Holding	NL
42	Powszechna Kasa Oszczednosci Bank Polski SA - PKO BP SA	PL
43	Banco BPI SA	PT
44	Banco Comercial Português, SA-Millennium bcp	PT
45	Caixa Geral de Depositos	PT
46	Nordea Bank AB (publ)	SE
47	Skandinaviska Enskilda Banken AB	SE
48	Svenska Handelsbanken AB	SE
49	Swedbank AB	SE
50	NLB dd-Nova Ljubljanska Banka d.d.	SI
51	Nova Kreditna Banka Maribor d.d.	SI

Note: The table reports the list of 51 banks included in the whole sample and the related country ISO-code.