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BANK BONDS: SIZE, SYSTEMIC RELEVANCE AND THE SOVEREIGN

by Andrea Zaghini*

Abstract

I analyze the risk premium on bank bonds at origination with special focus on the role of implicit and explicit public guarantees and the systemic relevance of issuing institutions. Looking at the asset swap spread on 5,500 bonds, I find that explicit guarantees and sovereign creditworthiness have a substantial effect on the risk premium. In addition, while large institutions still enjoy lower issuance costs linked to the TBTF framework, I find evidence of enhanced market discipline for systemically important banks which have faced an increased premium on bond placements since the onset of the financial crisis.

JEL Classification: G21, G18, G01.
Keywords: too-big-to-fail, market discipline, sovereign guarantees, G-SIFIs.

Contents

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1. Introduction[1]

The financial crisis that originated in the US subprime mortgage market in the summer of 2007 has negatively affected banks' funding conditions for an extended period of time. A general overhauling of risk profiles at both the corporate and the sovereign levels occurred, especially in some peripheral euro-area countries. In addition, national and supranational measures aimed at supporting the financial system and extensive changes in prudential regulation have made some financial instruments more attractive to banks than others. The aim of this paper is to investigate the evolution of the cost of bond funding over a period that includes both the first wave of the global financial crisis and the subsequent euro-area sovereign debt market turmoil.

A distinctive feature of this paper is the analysis of the actual cost of funding to banks, namely the price at which bonds are sold on the primary market. By relying on the asset swap spread paid at origination on over 5,500 bonds, I analyse the role played by bank characteristics, issuance features and market sentiment. I focus on two issues: i) the role of the sovereign in providing both implicit support to the financial system and explicit guarantees on bank bonds and ii) the growing size and complexity of financial institutions. The second issue is related to the distortions of the too-big-to-fail safety net granted to very large banks (Mishkin 2006) and the uncertainty of the too-complex-to-price syndrome of systemic institutions (Haldane 2012). However, while the former issue suggests weakened market discipline, the latter implies enhanced market monitoring.

As for the role of the sovereign, there is empirical evidence that governments of strong creditworthiness provide an implicit guarantee to the domestic banking system (Sironi 2003; Gropp et al. 2011; Packer and Tarashev 2011; Ueda and Weder di Mauro 2013). This effect occurs via a higher credit rating assigned to those financial institutions which benefit from the implicit support. In particular, rating agencies often assign two different ratings to banks, which are usually referred to as "stand-alone" and "all-in" ratings. Both reflect the assessment of the probability of default by the bank, but only the

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latter includes the possibility of a public bail-out. According to this literature, the difference between the two ratings should represent the uplift (i.e. the implicit support) provided by the sovereign. In addition to the implicit support, explicit government guarantees on bank bonds were introduced after the collapse of Lehman Brothers by almost all advanced economies. While guarantees proved effective in restoring bank funding, they were also a source of distortions for the corporate bond market. Indeed, the pricing of such bonds was strongly clustered on a country basis, suggesting that in many instances "weak" banks from "strong" countries had access to cheaper funding than "strong" banks from "weak" countries (Levy and Zaghini 2011; Grande et al. 2011).

Regarding bank size, this work is related to a recent strand of the empirical literature that tries to distinguish between the issue of size *per se* of financial institutions, which eventually leads to the too-big-to-fail safety net benefits, and the systemic dimensions of banks (relative size, interconnectedness and complexity), which might make them too-difficult-to-save (Völz and Wedow 2011; Demirgüç-Kunt and Huizinga 2013; Bertay et al. 2013). While the too-big-to-fail problem — in connection with negative externalities and moral hazard — has long been identified (O'Hara and Shaw 1990), the systemic relevance of banks and their implications for financial stability have attracted the attention of academics and, in particular, regulators only since the eruption of the 2007 financial crisis (Acharya 2009; BCBS 2011; Bernanke 2012). From a global perspective, what makes a financial institution systemically relevant is not (only) the size of its balance sheet but (also) its magnitude relative to the domestic economy, its degree of substitutability, its cross-country activities and its business model (FSB 2011).

I find that, compared to AAA-rated governments, lower-rated sovereigns add a burden to the cost of debt issuance of domestic banks. This implicit negative support intensified in the euro-area sovereign debt crisis: I estimate that the absence of the backing of a AAA-rated government amounts, *ceteris paribus*, to an average increase of over 140 basis points in the funding cost. However, once I restrict the analysis to banks for which CDS spreads are priced — usually larger institutions that are more active in the bond market — I find that the risk premium more closely reflects the characteristics of each institution (soundness and creditworthiness), with the role of government somewhat reduced.

Furthermore, by distinguishing between banks' absolute size (total assets) and systemic relevance (being included in the Financial Stability Board's list of global

systemically important financial institutions, G-SIFIs), I find that financial investors were able to disentangle the two issues. My results show that the safety net benefits granted to too-big-to-fail institutions include lower funding costs on the primary bond market (the larger the bank, the lower the premium). Yet, I also find evidence of enhanced market discipline: since the onset of the global financial crisis, systemically important banks — which enjoyed a reduction of the spread before the crisis — pay, *ceteris paribus*, a larger premium on their bond issuance.

The rest of the paper is organised as follows. Section 2 describes the dataset and the econometric methodology; section 3 analyses the factors influencing bond yield at origination over the period 2006-2011; section 4 provides robustness checks and section 5 presents the conclusions.

2. Methodology and data

In this section I outline a panel regression of the premium paid by banks on the primary market to assess the determinants of the cost of bond funding over the six years from 2006 to 2011. Since the risk-free component of the funding cost is unavoidable for the issuer, I focus on the asset swap (ASW) spread, which is the difference between the actual bond yield and the fixed rate of the asset swap contract with similar characteristics. I do not follow the ASW spread evolution on the market after the day of issuance because, from the point of view of the issuer, the secondary market pricing of any debt security does not change the cost of already placed bonds. I also avoid the use of secondary market spreads because of the poor liquidity in the trading of some securities. In doing so I follow the methodology used in the early contributions by Morgan and Stiroh (2001) and Sironi (2003) for the banking sector, which have recently been applied to the debt issuance of non-financial corporations by Pianeselli and Zaghini (2014). Although this approach reduces the time-series dimension of the sample, it still leads to a large selection of bonds and issuing institutions.

The dataset contains all bonds with maturity at origination of at least 1 year for which the ASW spread at issuance is available from Thomson Reuters Datastream. In particular, the final sample includes 5514 bonds issued by 209 banks from 14 countries.[2] There are 879

[2]The full list of banks in the sample is reported in Table A1 of the Appendix.

bonds from banks headquartered in the US, 462 from the UK, 2173 from Germany and 2001 from other euro-area countries (Table 1).

Table 1. ASW spread over time[1]

	2006	2007	2008	2009	2010	2011	Total
Austria	-14.7	-8.6	31.8	55.9	36.3	86.8	14.9
	30	*25*	*2*	*15*	*5*	*10*	*87*
Belgium	-21.3	6.9	9.4	65.4	71.9	83.0	31.2
	35	*36*	*34*	*17*	*26*	*35*	*183*
Cyprus	-47.0	-31.8		250.4			34.9
	1	*2*		*1*			*4*
Finland			63.2	58.3	26.3	91.6	61.9
			1	*2*	*4*	*5*	*12*
France	-29.7	-3.2	85.0	70.6	42.8	95.7	48.9
	55	*59*	*46*	*38*	*121*	*121*	*440*
Germany	-13.6	6.9	44.1	51.0	42.1	51.1	40.5
	155	*153*	*92*	*601*	*616*	*555*	*2172*
Greece	69.3	134.7	268.0	236.8	107.6	401.6	191.7
	5	*7*	*5*	*13*	*2*	*1*	*33*
Ireland	-26.8	-7.0	68.7	349.3	325.6		150.1
	16	*15*	*6*	*10*	*21*		*68*
Italy	-22.2	6.2	73.8	98.0	95.3	173.3	96.7
	36	*41*	*17*	*36*	*63*	*110*	*303*
Netherlands	-4.8	13.8	27.5	78.8	53.5	74.9	54.8
	39	*53*	*29*	*118*	*155*	*131*	*525*
Portugal	-48.7	-16.3	62.3	127.0	82.3	391.3	76.9
	9	*9*	*8*	*16*	*5*	*4*	*51*
Spain	-26.8	-3.6	95.8	122.5	163.6	238.5	120.2
	50	*41*	*28*	*31*	*55*	*90*	*295*
United Kingdom	5.4	27.2	98.4	98.1	160.8	110.0	89.1
	71	*53*	*54*	*112*	*81*	*91*	*462*
United States	9.1	55.1	105.0	126.7	194.7	197.0	119.4
	120	*187*	*98*	*140*	*144*	*190*	*879*
Total	-10.2	20.7	73.8	77.9	81.0	107.2	68.4
	622	*681*	*420*	*1150*	*1298*	*1343*	*5514*

Sources: *Dealogic* and Thomson Reuters Datastream.

[1] Basis points. Number of bonds in italics.

The evolution of the risk premium over time reflects the two waves of the global financial crisis: starting from the tranquil year 2006, in which the banks in the sample paid an average of -10 basis points, the ASW spread began an upward trend that led to a peak of 107 basis points in 2011. However, the dynamics are extremely heterogeneous across countries. While many countries experienced a steady increase of the AWS spread over time (Italy, Spain and the US among them), some peaked in 2009, recovered the following year, but witnessed a new spike in 2011 (Austria, Finland and France). At the same time, Germany, after a relatively mild increase in the premium in 2008, levelled off between 40 and 50 basis points. The UK is the only country in the sample for which the average ASW premium at bond origination declined in 2011.

A major aspect of the global financial crisis is that it induced significant substitution effects among financial instruments, including those within the medium- to longer-term bond class. Indeed, given the widespread change in risk assessment, the increase in interest rate spreads and the drying-up of several sources of funding (as well as the consequences of the sovereign debt crisis just few years later), there was a significant adjustment in banks' funding sources (Cardillo and Zaghini 2012; ECB 2012). In addition, rescue plans by governments, monetary authorities and supranational organizations, together with changes in market regulations, have often amplified the substitution among different securities (CGFS 2011). For instance, the exacerbation of the financial crisis following the collapse of Lehman Brothers in September 2008 led the governments of many advanced economies to use unprecedented amounts of state aid to support the financial sector. Among the most valuable tools was the introduction of explicit government guarantees on bank fixed-income debt against the payment of a fee by the issuer. Government-guaranteed bonds quickly became a key source of bank funding (Panetta et al. 2009; Stolz and Wedow 2010). Notwithstanding the possible distortionary effects on bank risk taking and the unsolved quest for the "fair price" of public guarantees (Arping 2010; Gropp et al. 2011; Ejsing and Lemke 2011), financial institutions have made extensive use of such bonds: in the period from October 2008 to May 2010 close to 1400 guaranteed bonds were issued by approximately 200 banks from 17 countries, for an amount totalling more than €1 trillion (Lindh and Schich 2012).[3]

Table 2 reports country issuance by type of bond. They can be classified into four deal types: covered bonds, government-guaranteed bonds, senior bonds and subordinated bonds. While senior bonds are the bedrock of banks' issuance, the other kinds of bonds have also been used by a large number of institutions. Out of the 209 banks in the sample, 180 tapped the market with standard senior placements, 78 made use of covered bonds, 64 were able to place subordinated debt and 47 exploited the possibility of buying a public guarantee. While there is again strong heterogeneity across countries, the average cost of the four kinds of placement clearly reflects the risk of the type of deal, with subordinated debt paying a larger

[3]In addition to euro-area countries, the UK and the US, several other advanced economies introduced government guarantees on banks' debt (Australia, Denmark, New Zealand and South Korea, among others). Moreover, the issuance of bonds was also affected, at least in the euro area, by the two ECB covered bond purchase programmes (CBPP1 and CBPP2) implemented from the second half of 2009, under which the Eurosystem bought eligible covered bonds up to a nominal value of €60 billion and €40 billion respectively (Beirne et al. 2011).

spread than senior bonds (176 versus 77 basis points) and the two secured issuances being able to get a better price at origination: 45 basis points for covered bonds and 28 basis points for government-guaranteed issuances.

Table 2. ASW spread by type of deal[1]

	CB	GGB	SEN	SUB	Total
Austria	71.0	44.6	-1.1	62.2	14.9
	2	*4*	*7*	*4*	*10*
Belgium	23.3	33.8	46.0		31.2
	1	*1*	*3*		*3*
Cyprus			34.9		34.9
			2		*2*
Finland	46.5		65.0		61.9
	1		*1*		*2*
France	42.8	-26.3	51.0	113.7	48.9
	3	*1*	*18*	*6*	*18*
Germany	26.7	156.6	55.6	154.8	40.5
	27	*2*	*25*	*8*	*30*
Greece	90.1	233.7	197.5	75.3	191.7
	1	*1*	*3*	*1*	*4*
Ireland		167.3	12.4	577.2	150.1
		3	*3*	*2*	*4*
Italy	90.7		88.5	186.5	96.7
	9		*28*	*10*	*29*
Netherlands	66.9	34.0	51.7	211.8	54.8
	2	*5*	*7*	*5*	*10*
Portugal	128.0	90.3	46.8	316.5	76.9
	4	*3*	*6*	*1*	*7*
Spain	169.6	72.1	37.8	293.6	120.2
	19	*5*	*27*	*6*	*32*
United Kingdom	80.2	15.5	98.4	147.1	89.1
	9	*5*	*16*	*9*	*17*
United States		6.4	137.7	94.9	119.4
		17	*34*	*12*	*42*
Total	44.7	28.2	77.1	176.1	68.4
	78	47	180	64	209

Sources: *Dealogic* and Thomson Reuters Datastream.

[1] Basis points. Number of issuing banks in italics.

The analysis of the determinants of the risk premium on bank bonds is based on two main sources of influence: the characteristics of the issuer and the characteristics of the bond itself. In addition, I also take into account that the market pricing can be directly and indirectly influenced by the sovereign's soundness. To disentangle the contribution of each

group of variables I run the following regression by means of pooled OLS with time dummies:

$$spread_i = \alpha_0 + \sum \alpha_j V_{i,j}^{issuer} + \sum \alpha_k V_{i,k}^{issue} + \sum \alpha_l V_{i,l}^{country} + \sum \alpha_z D_z^{time} + \varepsilon_i ,$$

where *spread* is the ASW spread at launch, V_j^{issuer} are the variables characterising the issuer (size, rating, CDS spread), V_k^{issue} are the bond features (volume, maturity, currency and rating), $V_i^{country}$ are the characteristics of the country of residence of the issuer parent (rating and geographical area) and D_z^{time} are (yearly) time dummies that take into account the market conditions at the time of the issuance.[4] Table 3 reports the summary statistics of the main variables employed in the estimations (excluding dummy variables). All exogenous variables are taken at time *t* (the exact issuance day) with the exception of balance sheet data, which are lagged by one year.[5]

Ceteris paribus, I expect bonds with higher ratings to carry lower spreads. With regard to the size of the issue, institutions that are more creditworthy typically find it easier to place larger issues, but they may face higher costs (yields) to generate a sufficiently large demand for their placements. It follows that the relationship between the bond size and the spread is ambiguous. At the same time, banks that are more creditworthy usually find it easier to issue longer-term bonds, but this kind of bond tends to be coupled with a higher yield due to the longer redemption horizon. Again, the sign of the coefficient is a matter of empirical assessment.

[4] The dataset includes information from several databases. In addition to Thomson Reuters Datastream, from which the ASW spread is sourced, banks' balance sheet dimensions and the numbers of employees come from SNL Financial and Bankscope, CDS spreads and government ratings come from Bloomberg, and the bond features (bond rating, maturity, volume, currency of denomination and type of deal) as well as the bank nationality and rating on the day of issuance come from DCM Analytics by Dealogic. Finally, the list of G-SIFIs is taken from FSB (2011, 2012).

[5] Regarding the dummy variables: the rating of the issuer and the rating of the bonds are the average of the ratings provided by Moody's, Fitch and Standard & Poor's linearised between 0 (C-) and 20 (AAA); the rating of the sovereign takes the value 0 for AAA-rated countries and 1 otherwise; the time dummies take the value 1 for each given year from 2006 to 2011 and 0 otherwise; the currency denomination dummy takes the value 1 for euro-denominated bonds and 0 otherwise; subordinated debt, covered bond and government-guaranteed bond dummies take the value 1 for each specific deal type and 0 otherwise; the sovereign debt crisis dummy takes the value 1 from 2010Q3 to 2011Q4 and 0 otherwise; the global financial crisis dummy takes the value 1 from 2007Q4 to 2011Q4 and 0 otherwise; and the pre-crisis dummy takes the value 1 in the period 2006Q1-2007Q3 and 0 otherwise.

As regards the size (log of total assets) of the banks, I expect a negative sign for the regression coefficient insofar as large banks are supposed to benefit from the implicit too-big-to-fail (TBTF) support of the government. In particular, the idea is that governments will not allow large financial institutions to go bankrupt when their failure would trigger significant disruptions in the domestic financial system. Thus, it is assumed that, because of TBTF support, investors expect the government to back the debts of these institutions should they face financial stress (Anginer and Warburton 2014; Santos 2014). This expectation is referred to as an implicit guarantee as there is no official commitment from the authorities.

Table 3. Summary statistics

	Observations	Mean	Median	Std. Dev.	Max	Min
ASW spread	5514	68.4	45.2	110	1119	-121
Total asset	5514	496237	273067	524741	2154650	18
Duration	5514	1990	1431.5	2242	36540	365
Volume	5514	400	100	649	15000	0.1
Bond rating	5514	15.09	15	2.57	20	2
Bank rating	5514	16.83	16	2.73	20	2
Bank CDS	1659	178.7	142.6	179.9	1569	5
Employees	5514	50136	21051	70321	312356	32

This table presents summary statistics. ASW spread is the difference between the bond yield and the fixed-leg rate of a swap contract with the same maturity (basis points). Total asset is the bank balance sheet value of all assets (millions of euros). Duration is the bond maturity at issuance (days). Bond Rating and Bank Rating are the average of the ratings provided by Moody's, Fitch and Standard & Poor's linearised between 0 (C-) and 20 (AAA). Bank CDS is the average of the daily credit default swap for 5-year contracts computed in the 15-day period before the bond issuance (basis points). Employees is the number of employees working for the bank.

A different and more recent concern relates to the systemic relevance of financial institutions. Indeed, the global financial crisis has highlighted the inadequacy of banking regulation, with too much focus on microprudential supervision and an almost neglected macroprudential policy (Borio 2011; Bernanke 2012). The collapse of Lehman Brothers in 2008 made clear how the turmoil following the failure of a single institution that was well-connected and with large exposures to many market segments may spill over to several

countries and pose a serious threat to global financial stability.[6] The pricing of bonds of these large and complex institutions are subject to two different influences that carry opposing effects. On the one hand, the externalities associated with large institutions themselves perceived as TBTF may well be applied to their interconnectedness, complexity, lack of substitutability and global scope. On the other hand, the balance sheet of such institutions, linked to a business model that generally places greater emphasis on trading and capital market–related activities, may have become less transparent. After the eruption of the global financial crisis, the perceived risk of systemic institutions may well have changed, leading to the too-complex-to-price syndrome: they are becoming too complex to be managed in any effective way (Haldane 2012).

3. The cost of bonds

The first column of Table 4 shows the baseline regression. As expected, the bank characteristics suggest that the rating of the bank has a negative influence on the spread at launch: the better the rating, the lower the issuance cost.[7] Among the issue features, the maturity of the bond at issuance is positively related to the cost, while the bond rating negatively affects the ASW spread. The decision to issue subordinated debt leads to an increase of 57 basis points with respect to senior bonds, while the coefficient of the covered bonds is not statistically different from zero. Another bond characteristic that is statistically significant is whether the issue is denominated in euros: bonds denominated in euros pay a spread that is 56 basis points cheaper than those in other currencies.

To take into account effects of the nationality of the issuer, I include a sovereign rating dummy variable in the baseline regression,[8] with the idea that governments of strong creditworthiness provide an implicit guarantee to the whole domestic banking system. The

[6]The IMF/BIS/FSB (2009) Report was the first official publication dealing with the issue of financial institutions' systemic relevance; it provided the first "guidance for national authorities to assess the systemic importance of financial institutions, markets and instruments". The rule book by the Basel Committee on Banking Supervision (2011) contains instead the methodology to identify global systematically important financial institutions (G-SIFIs). The Financial Stability Board is in charge of publishing the list of G-SIFIs each year.

[7]The standard errors reported in the tables (from Table 4 to Table 7) are clustered by country of residence of the issuer. The statistical significance of the coefficients is not affected when clustering by type of deal.

[8]To take into account possible non-linearities in the relation, particularly due to the flight to quality phenomenon, the variable takes the value of 0 for AAA-rated countries and 1 otherwise. When running the robustness checks I use a linearised version of the variable.

variable turns out to be highly significant: banks from non-AAA states pay 80 basis points more to issue bonds than banks with AAA-rated sovereigns.

I then add two other variables in order to consider, first, the distinctive features of the government guaranteed issues and, second, the turbulence spilling over to the corporate bond market from the sovereign debt market from mid-2010 (Table 4, second column).[9] As for the former, the support of the public scheme can be measured as an average reduction in the issuance premium of around 32 basis points. Regarding the spillover due to the sovereign debt crisis, the increase in the ASW spread at origination due to the crisis amounts to 33 basis points. However, these two coefficients do not consider the effect (negative or positive) of the creditworthiness of the sovereign in those particular contexts. I thus interact the two dummy variables with the sovereign rating variable. Column 3 of Table 4 shows that there are indeed significant differences between AAA-rated countries and the others. The explicit guarantee of a weak sovereign is worth 116 basis points less than the one from a top-rated sovereign. Given the large difference, this in turn suggests that it might well be the case that riskier banks (i.e. those with lower ratings) that are from sounder states could tap the bond market at a better price than sounder banks from weaker states. This confirms the finding in Levy and Zaghini (2011) and Grande et al. (2011) that in the guaranteed bank–debt market the security pricing strongly reflects the characteristics of the guarantor, while bank-specific and issue-specific factors play a minor role.

From the regression coefficients I can also compute the value of the government support during the period of turbulence in the sovereign debt market. The results show a significantly negative spillover from weak governments to bank funding costs. During the sovereign debt crisis the backing of a lower-than-AAA-rated sovereign amounts, *ceteris paribus*, to an increase of 143 basis points in the ASW spread paid at origination by banks headquartered in those countries.[10]

[9] Note that the effect of all the other measures devised to support the financial system during the crisis — which do not show up explicitly as a bond feature — are incorporated in the rating of the bank.

[10] Given that the "Sovereign debt crisis" variable is not significantly different from zero (Table 4, third column), the overall effect of a non-AAA-rated government is given by the sum of the "Weak sovereign rating" variable (33 bps) and the interaction between the "Weak sovereign rating" and the time dummy "Debt crisis" (110 bps). Also taking into account the "Sovereign debt crisis" variable would lead to a further deterioration of just 12 basis points.

Table 4. Pooled OLS regressions[1]

Duration	**0.011** ***	**0.010** ***	**0.010** ***
	0.002	0.002	0.001
Bond Rating	**-8.378** ***	**-7.820** ***	**-7.172** ***
	2.965	2.850	2.337
Subordinated debt	**57.01** *	**66.25** *	**65.50** *
	39.278	39.830	39.679
Covered Bonds	**3.667**	**7.425**	**4.02**
	18.035	16.993	14.821
Bank Rating	**-7.754** **	**-7.554** **	**-7.640** **
	3.448	3.438	3.470
Issuance in euros	**-56.17** ***	**-56.32** ***	**-52.92** ***
	12.494	11.895	10.361
Weak Sovereign Rating	**79.88** **	**75.06** **	**33.49** **
	29.994	28.904	26.744
Government Guarantee		**-32.13** *	**-44.53** *
		19.071	11.277
Sovereign Debt Crisis		**33.35** *	**12.36**
		18.592	8.661
SovRat*GovGuarant			**116.3** *
			71.376
SovRat*DebtCrisis			**109.8** ***
			19.040
R-squared	**0.224**	**0.237**	**0.263**

[1] Dependent variable: ASW spread; included observations: 5514; clustered standard errors by country; symbols *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

In order to have a more detailed picture of bank bond issuance, and as a robustness check, I now restrict the sample to banks for which a CDS is priced — usually larger institutions that are more active on the debt market. The number of bonds is reduced to 1659, issued by 142 banks. Even though the sample reduction is sizeable, I introduce into the empirical investigation an important quantitative variable describing the market perception of the soundness and creditworthiness of each institution.

The first column of Table 5 shows that the CDS coefficient is highly significant and displays the expected sign: a deterioration in the perceived soundness of the bank (an

increase in the CDS) leads to an increase in the cost of funding.[11] For the period of the financial crisis, the cost of debt issuance for these institutions is also cheaper when accompanied by the public guarantee and more expensive during the sovereign debt crisis (second column).

Table 5. Pooled OLS regressions[1]

Duration	**0.014** ***	**0.013** ***	**0.014** ***
	0.002	0.002	0.002
Bond Rating	**-9.388** ***	**-9.411** ***	**-9.715** ***
	1.389	1.388	1.474
Subordinated debt	**131.3** ***	**136.9** ***	**139.8** *
	29.662	29.542	29.984
Covered bonds	**19.54** *	**19.71** *	**15.04**
	10.262	10.197	10.130
Bank rating	**-12.17** ***	**-11.72** ***	**-11.43** ***
	2.393	2.369	2.356
Issuance in euros	**-38.20** ***	**-38.13** ***	**-37.49** ***
	6.510	6.528	6.553
Weak sovereign rating	**73.80** ***	**70.41** ***	**47.38** ***
	7.624	7.576	10.121
Bank CDS	**0.061** ***	**0.050** ***	**0.053** ***
	0.014	0.014	0.014
Government guarantee		**-39.85** ***	**-45.46** ***
		12.355	12.457
Sovereign debt crisis		**17.93** *	**-0.072**
		7.605	6.926
SovRat*GovGuarant			**17.73**
			27.778
SovRat*DebtCrisis			**62.76** ***
			16.959
R-squared	**0.310**	**0.313**	**0.322**

[1] Dependent variable: ASW spread; included observations: 1659; clustered standard errors by country; symbols *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

However, when assessing the creditworthiness of the sovereign as guarantor and during the crisis (third column), two circumstances stand out. First, the fact that a lower-rated government is backing the debt issuance does not have an additional (negative) effect on the cost of guaranteed bank bonds. Second, for the whole sample of banks, the sovereign debt crisis seems to affect only the issuers headquartered in the lower rated countries —

[11] Note that CDS spreads price not only the default risk of the bank but also the liquidity premium on the outstanding debt of that institution (Bongaerts et al. 2011; Badaoui et al. 2013).

those more exposed to the crisis. These findings suggest that the market is attaching more importance to the characteristics of the bank (part of the risk being captured by the CDS). When I compute the difference between the guaranteed issuance of banks in lower-rated countries and that from banks in AAA-rated countries, the spread is only 47 basis points (the "Weak sovereign rating" dummy). At the same time, the weakness of sovereigns significantly spilled over to the home banking systems during the sovereign debt crisis: the difference between top-rated and lower-rated countries amounted to 110 basis points.

As a further step in the analysis I check for a relationship between banks' dimension/systemic weight and the premium paid on bonds by introducing in the empirical framework both the size of the balance sheet (measured by the log of total assets) and a variable identifying the banks' systemic relevance (being in the FSB's 2011 list of the 29 G-SIFIs).

The first column of Table 6 shows that bank size has a negative coefficient, consistent with the too-big-to-fail hypothesis, confirming that a larger size tends to induce lower funding costs (Acharya et al. 2013; Santos 2014). At the same time, the coefficient for the systemic relevance of financial institutions is not significantly different from zero, suggesting that systemic relevance might not be an additional issue with respect to the TBTF framework. However, when taking into account the likely non-linearity of the relationship, due to the fact that systemic relevance is a more recent concern, different evidence emerges. The systemic relevance coefficient shows significantly different behaviour in the period before the disruption of the US subprime market (2006Q1-2007Q3) from the period during the global financial crisis (2007Q4- 2011Q4). Before the crisis, the market assessment of systemically important banks was benevolent: there was a large discount of 62 basis points in the risk premium associated with bond issuance of G-SIFIs (Table 6, second column). It is very likely that the implications of the systemic relevance of financial institutions were reinforcing the TBTF argument. Yet, financial agents' attitude towards those institutions changed direction during the crisis: debt issuance began to occur at a higher premium (37 basis points), suggesting the emergence of active market monitoring. Thus, these results support the hypothesis that market participants are now aware of the new framework in which G-SIFIs operate and opt for a more cautious approach when dealing with their debt. The outbreak of the crisis and the demise of Lehman Brothers in particular may have acted as a wake-up call for investors. These results are confirmed when estimating a richer

econometric framework. Column 3 and column 4 of Table 6 show the panel estimations when I introduce the country fixed effects and the type of deal fixed effects.

Table 6. Panel regressions[1]

	Pooled		Fixed Effects	
	(a)		(b)	(c)
Duration	**0.012** ***	**0.012** ***	**0.012** ***	**0.010** ***
	0.002	0.002	0.002	0.003
Bond rating	**-8.005** ***	**-6.831** ***	**-7.039** ***	**-8.416** ***
	2.283	2.244	1.961	1.404
Bank rating	**-7.371** **	**-8.083** **	**-8.458** **	**-7.962** *
	3.464	3.638	3.510	5.315
Issuance in euros	**-27.24** **	**-25.62** **	**-26.60** **	**-39.08** **
	10.175	9.110	4.436	17.040
Sovereign debt crisis	**39.93** *	**28.10** *	**28.12** *	**28.64** **
	22.154	18.642	18.020	9.859
Total assets	**-15.23** **	**-17.52** ***	**-15.51** ***	**-16.37** **
	7.245	6.340	2.617	8.834
G-SIFI	**8.312**			
	16.740			
G-SIFI*Pre-Global Crisis		**-61.82** ***	**-66.10** ***	**-69.19** **
		15.453	10.937	17.225
G-SIFI*Post-Global Crisis		**37.10** **	**32.61** ***	**38.11** **
		16.935	11.161	15.738
R-squared	**0.234**	**0.235**	**0.342**	**0.339**

1 Dependent variable: ASW spread; included observations: 5514; (a) clustered standard errors by country; (b) fixed effects by country; (c) fixed effects by type of deal; symbols *, ** and *** denote statistical significance at 10%, 5% and 1% levels, respectively.

These results are in line with the recent empirical literature. Enhanced market discipline for banks of systemic relevance is also found by Bertay et al. (2013), who analyse the cost and growth of deposits as market indicators of bank funding costs. In addition, by looking at the CDS market Völz and Wedow (2011) find a negative coefficient on the size variable and a positive coefficient on the square of the same variable, which is taken as the index of the systemic relevance of banks or, in their words, as the indicator that banks have become too-big-to-rescue.

4. Robustness

As robustness checks of these results I use several alternative definitions of G-SIFIs: the updated list provided by FSB (2012), which identifies 28 G-SIFIs, the combination of the two lists FSB (2011) and FSB (2012), which leads to 31 G-SIFIs, and the ranking provided by Masciantonio (2013), which replicates the FSB methodology using publicly available market data (27 G-SIFIs). Given the high correlation between the rating of the bond and the rating of the issuer, I drop one of the two alternately in the regressions. I also employ a variable for the sovereign rating constructed with the same linearisation applied to the rating of the issuer and the bond instead of the AAA dummy. Finally, I rely on different time windows for the definition of "financial crisis" and "sovereign debt crisis". My findings about the sovereign influence and the difference between size and systemic relevance are not affected.

Table 7. Panel regressions for senior unsecured bonds[1]

Duration	**0.014** ***	**0.014** ***	**0.012** ***
	0.002	0.002	0.002
Bond rating	**-4.481**	**-4.467**	**-6.122** ***
	4.365	4.391	4.589
Bank rating	**-19.33** ***	**-19.34** ***	**-20.18** **
	3.412	3.350	4.447
Issuance in euros	**-40.73** ***	**-41.34** ***	**-39.14** **
	10.540	10.715	5.557
Weak sovereign rating	**172.2** ***	**125.0** *	
	51.625	75.681	
Sovereign debt crisis	**19.23** *	**8.84** **	
	12.631	4.923	
SovRat*DebtCrisis		**77.39** *	
		45.913	
Total assets			**-14.78** ***
			9.467
G-SIFI*Pre-Global Crisis			**-70.49** ***
			11.459
G-SIFI*Post-Global Crisis			**26.57** ***
			8.728
R-squared	**0.231**	**0.240**	**0.244**

[1] Dependent variable: ASW spread; included observations: 3587; fixed effects by country; symbols *, ** and *** denote statistical significance at 10%, 5% and 1% levels, respectively.

I run a further test for the sub-sample of senior unsecured bonds, which is a set of much more homogeneous bonds that forms the base of banks' long-term funding. Regressions for the 3587 senior bonds confirm the main findings of the paper. First, banks that are headquartered in countries with a rating lower than AAA face, *ceteris paribus*, much higher costs than peers located in top-rated economies — a difference of 172 basis points (Table 7, column 1). Moreover, the strain of the sovereign debt crisis is almost entirely felt in lower-rated countries (an increase in the ASW spread of 86 basis points), whereas the additional cost paid by banks in AAA-rated economies is just 9 basis points (Table 7, column 2). Finally, the evolution of market sentiment with respect to the issuance activity of G-SIFIs is also confirmed: before the global financial crisis, banks that were labelled systemically important benefitted from a sizeable discount (70 basis points), whereas during the crisis G-SIFIs underwent enhanced market discipline, which translates into an increase of 27 basis points in the premium paid at origination (Table 7, column 3).

5. Conclusion

The paper provides an assessment of the determinants of the premium paid on bond issuance by banks in the US, the euro area and the UK. I focus on a period (2006-2011) that includes the whole of the global financial crisis starting in the summer of 2007, which evolved into a painful sovereign debt crisis in several euro-area countries. The crisis has caused a deterioration in banks' funding conditions, leading in some cases to the drying-up of funding sources, the impairment of market segments and significant substitution effects among financial instruments. In addition, starting from mid-2010, concerns about the sustainability of public finances in several euro-area countries led to a deterioration in perceived sovereign creditworthiness. In parallel with the worsening of funding conditions in the home country and the related sovereign downgrades by rating agencies, many banks suffered the same fate, with increasing CDS spreads and widespread downgrades by several notches, further impairing banks' funding conditions.

In order to disentangle the factors affecting the cost of bond issuance I constructed an empirical investigation of the risk premium at origination on 5,500 bonds. I found that the backing of a AAA-rated sovereign provides an important implicit support to the home banking system, while weaker governments increase the funding cost of banks. I estimate that during the most acute phase of the sovereign debt crisis the absence of a AAA-rated

government implicit support amounts, *ceteris paribus*, to an increase of 143 basis points in the ASW spread paid at launch by domestic banks. Furthermore, in line with the recent literature on government-guaranteed bank bonds, I observe that the security pricing of explicitly guaranteed debt largely reflects the soundness of the sovereign. Yet, when looking at banks having a CDS — usually institutions which tap bond markets more regularly — I find that premia required by investors are more closely related to the characteristics of each bank, with the sovereign role partially downsized.

All in all, these findings suggest that there is a direct linkage between sovereign creditworthiness and (domestic) banks' funding cost, and that this linkage is particularly strong in crisis periods. This in turn implies that rating agencies play an important role in the market pricing process. Indeed, when they assign a sovereign rating, they directly influence the sovereign debt market and indirectly the corporate bond market. Thus not only the grade of the rating but also the timing of the decision can have significant implications for the funding choice of the domestic banking system (Cole and Cooley 2014).

In addition, by focusing on balance sheet dimension and degree of complexity of banks, I investigate whether the size and the systemic relevance of financial institutions matter for the pricing of bonds at origination. Indeed, the substantial involvement of large and complex financial institutions in the international spreading of the financial crisis has already prompted a reassessment of the rules under which they operate, aimed at making the failure of G-SIFIs less likely and the impact of their bankruptcy less widespread and costly (BCBS 2011). I find that this process makes a difference in banks' funding conditions and that financial investors are able to disentangle the two issues of size and systemic relevance. On the one hand, my results suggest that the size of the bank is negatively associated with the cost of bond financing, thus expanding the list of the of too-big-to-fail benefits to a reduced premium paid on the primary debt market. On the other hand, I find evidence of enhanced market discipline of systemically important banks in the late phase of the global financial crisis, with G-SIFIs facing an increased premium on their debt issuance. The latter finding points to a change in the market perception of the risk of G-SIFIs and to a shift towards a closer scrutiny of large and complex financial institutions. In particular, bondholders may consider it more likely than before that they will become involved (bailed-in) in the case of a managed resolution. However, it might well be that once the cross-border supervision of G-SIFIs is fully in place, with capital adequacy ratio surcharges and cross-

border coordinated recovery and resolution plans, financial markets will assess the risk of such institutions differently.

Appendix

Table A1 Banks in the sample by parent nationality

Austria (10)	Caisse Nationale des Caisses d'Epargne et de Prevoyance SA - CNCE	Deutsche Genossenschafts-Hypothekenbank AG
Ceska SporitelnaAS	Compagnie Financiere du Credit Mutuel	Deutsche Hypothekenbank AG
Erste Group Bank AG	Credit Agricole	Deutsche Postbank AG
Hypo Alpe-Adria-Bank International AG	Credit Foncier de France SA - CFF	Deutsche Schiffsbank AG
Hypo Tirol Bank AG	Credit Industriel et Commercial SA - CIC	DVB Bank AG
KAAG	DEXIA Credit Local	DZ Bank AG
Kommunalkredit	Emporiki Group Finance plc	Eurohypo AG
Oesterreichische Volksbanken AG	Findomestic Banca SpA	HSH Nordbank AG
Raiffeisen Bank International AG	Fortis Bank SA/NV	HYPO REAL ESTATE
Raiffeisen Zentralbank Oesterreich AG - RZB	Groupe Credit Mutuel CEE	Landesbank Baden-Wuerttemberg - LBBW
Vorarlberger Landes- und Hypothekenbank AG	Klepierre financing	Landesbank Berlin AG
Belgium (3)	NATIXIS SA	Landesbank Hessen-Thueringen Girozentrale - Helaba
DEXIA Bank	SGA Societe Generale Acceptance NV	Landesbank Rheinland-Pfalz Girozentrale - LRP
IIB Capital plc	Societe Generale	Landesbank Saar
KBC Bank NV	UkrSibbank AKIB	Muenchener Hypothekenbank eG
Cyprus (2)	**Germany (30)**	Norddeutsche Landesbank Girozentrale - NORD/LB
Bank of Cyprus Public Co Ltd	Aareal Bank AG	Sparkasse KoelnBonn
Marfin Popular Bank Public Co	Bank Forum OAO	Westdeutsche ImmobilienBank AG
Finland (2)	Bayerische Landesbank	WestLB AG
OP Mortgage Bank	Berlin-Hannoversche Hypothekenbank AG	WL Bank AG Westfaelische Landschaft Bodenkreditbank
Pohjola Bank plc	Bremer Landesbank Kreditanstalt Oldenburg Girozentrale	Wuestenrot Bank AG Pfandbriefbank
France (18)	Commerzbank AG	**Greece (4)**
Banque Federative du Credit Mutuel - BFCM	Corealcredit Bank AG	EFG Hellas plc
BNP Paribas	DAPO Bank	FinansBank AS
Caisse Centrale du Credit Immobilier de France - 3CIF	Deutsche Bank AG	National Bank of Greece SA

Table A1 Banks in the sample by parent nationality (continued)

Piraeus Group Finance plc

Ireland (4)

Allied Irish Banks plc

Anglo Irish Bank

Bank of Ireland

Irish Nationwide Building Society

Italy (29)

Banca Carige SpA

Banca delle Marche SpA

Banca IMI SpA

Banca Italease SpA

Banca Lombarda e Piemontese SpA

Banca Monte dei Paschi di Siena SpA - MPS

Banca Popolare dell'Alto Adige - Sudtiroler Volksbank

Banca Popolare dell'Emilia Romagna Scarl

Banca Popolare dell'Etruria e del Lazio Scarl

Banca Popolare di Cividale Scarl

Banca Popolare di Milano Scarl

Banca Popolare di Vicenza Scarl

Banca Popolare Italiana Scarl

Banco Popolare Scarl

Bayerische Hypo- und Vereinsbank AG - HVB Group

Capitalia SpA

Cassa di Risparmio di Bolzano SpA (Suedtiroler Sparkasse AG)

Cassa di Risparmio di Ferrara SpA

Centro Leasing Banca SpA

CIB Bank Ltd

Credito Emiliano SpA

Credito Valtellinese Scarl - Creval

Intesa Sanpaolo SpA

Mediobanca

Sanpaolo IMI SpA

Ukrsotsbank PJSC

UniCredit Bank

Unione di Banche Italiane Scpa - UBI Banca

Veneto Banca Holding ScpA

Netherlands (10)

ABN AMRO Bank NV

Achmea Hypo Bank

Fortis Bank

Friesland Bank NV

ING Bank NV

Leaseplan

NIBC Bank NV

Rabobank Nederland

SNS Bank NV

Tango Finance Corp

Portugal (7)

Banco BPI

Banco Comercial Portugues

Banco Espirito Santo

Banif

BES

Caixa Economica Montepio Geral

Caixa Geral Depo

Spain (32)

Abbey National Treasury Services plc

Alliance & Leicester plc

Banco de Sabadell SA

Banco de Valencia SA

Banco Pastor SA

Banco Popular Espanol SA

Banesto

Bankinter

BBVA

Caixa de Ahorros de Vigo Ourense e Pontevedra - Caixanova

Caixa d'Estalvis de Catalunya

Caixa d'Estalvis de Girona

Caixa d'Estalvis de Terrassa

Caixa d'Estalvis del Penedes

Caixa Girona

Caja de Ahorros de Castilla la Mancha - CCM

Caja de Ahorros de Murcia - Caja Murcia

Caja de Ahorros de Valencia Castellon y Alicante

Caja de Ahorros del Mediterraneo - CAM

Table A1 Banks in the sample by parent nationality (continued)

Caja de Ahorros Municipal de Burgos
Caja de Ahorros y Monte de Piedad de Avila - Caja de Avila
Caja de Ahorros y Monte de Piedad de Madrid - Caja Madrid
Caja de Ahorros y Pensiones de Barcelona - La Caixa
Caja Espana de Inversiones Salamanca y Soria Caja de Ahorros
Caja Granada
Cajamar
Catalunya Caixa - Caixa d'Estalvis de Catalunya Tarragona & Manresa
Ibercaja
Kutxa
Newcastle Building Society
Santander
Univaja

United Kingdom (17)

ABSA Bank Ltd
Bank of Scotland
Barclays Bank plc
Bradford & Bingley plc
Coventry Building Society
Dunfermline Building Society
Hang Seng Bank Ltd
HBOS
HSBC Bank plc
Leeds Building Society
Lloyds TSB Bank plc
Principality Building Society
Royal Bank of Scotland
Skipton Building Society
Standard Chartered plc
Ulster Bank Finance plc
Yorkshire Building Society

United States (42)

Associated Banc-Corp
Bank of America Corp
Bank of New York Mellon Corp
BB&T Corp
Capital One Financial Corp
Centauri Corp
CIT Group Inc
Citigroup Inc
City National Corp
Comerica Bank
Countrywide Financial Corp
Fifth Third Bancorp
First Midwest Bancorp Inc
First Niagara Group Inc
Fulton Corp
Genelral Eelectric CAP CRP
GMAC INC
Goldman Sachs Group Inc
HSBC Bank plc
Jefferies Group Inc
JP Morgan Chase & Co
KEYCORP
M&T Bank Corp
Mellon Funding Corp
METLIFE INC
Morgan Stanley
National City Bank
Northern Trust Corp
NY Community Bank
PNC Funding Corp
Regions Bank
State Street Corp
SunTrust Bank
SVB Financial Group
US Bancorp
USI Holdings Corp
Wachovia Bank NA
Washington Mutual Inc
Wells Fargo & Co
Western Alliance Bancorp
Wilmington Trust Corp
Zions Bancorp

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