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BANK BONDS: SIZE, SYSTEMIC RELEVANCE AND THE SOVEREIGN

by Andrea Zaghini[*]

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Abstract

We analyze the risk premium on bank bonds at origination with a special focus on the role of implicit and explicit public guarantees and the systemic relevance of the issuing institutions. By looking at the asset swap spread on 5,500 bonds, we 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, we find evidence of enhanced market disciple for systemically important banks which face, since the onset of the financial crisis, an increased premium on bond placements.

Key words: Too-big-to-fail, Market discipline, Sovereign guarantees, G-SIFIs.
JEL Classification: G21; G01; G18.

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1. Introduction[1]

The financial crisis that originated in the US subprime mortgage market in the summer 2007 has negatively affected banks' funding conditions for an extended period of time, especially in some peripheral euro area countries, due to a general overhauling of risk profiles both at the corporate and sovereign level. In addition, national and supranational measures aimed at supporting the financial system and extensive changes in prudential regulation have often induced market distortions and substitution effects among different financial instruments. The aim of the paper is to investigate the evolution of the cost of bond funding over a period which include the first wave of the global financial crisis and the following euro area sovereign debt market turmoil.

A distinctive feature of our paper is that we look at the cost of funding actually faced by banks, namely the price at which the bond is sold on the primary market. By relying on the asset swap spread paid at origination on over 5,500 bonds, we analyse the role played by ban k characteristics, issuance features and market sentiments. We focus on two issues: the role of the sovereign in providing both implicit support to the financial system and explicit guarantees on bank bonds, and the growing size and complexity of financial institutions leading to the too-big-to-fail safety net (Mishkin, 2006) and the too-complex-to-price syndrome (Haldane, 2012), which have opposite implications for investors' monitoring. In fact, the former suggest a weakened market discipline, whereas 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 banking system of the domestic economy (Sironi 2003; Gropp et al. 2011, Packer and Tarashev 2011; Ueda and Weder di Mauro 2013). This effect goes through a higher rating assigned to financial institutions which benefit of 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. More recently, explicit government guarantees on bank bonds were introduced since October 2008 by almost all advanced economies in response to the sharp deterioration of financial market conditions which followed the collapse of Lehman Brothers. While guarantees proved effective in restoring bank funding, they were also responsible of distortions in the functioning of the corporate bond market. In fact, 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).

As concern banks' dimension, our work is related to a recent strand of the empirical literature which tries to distinguish between the issue related to the size *per sé* of a 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 makes 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 been identified since long (O'Hara and Shaw 1990), the systemic relevance of banks and the \implications for the financial stability have attracted the attention of academics and, in particular, regulators only after the eruption of the 2007 financial crisis (Acharya 2009, BCBS 2011, Bernanke 2012). Indeed, what makes a financial institution systemically relevant is not (only) the balance sheet size but (also) its magnitude relative to the economy, the degree of substitutability, the cross-country activities and the business model (FSB 2011).

To preview our results, we show that, with respect to AAA-rated governments, lower rated sovereigns add a burden to the cost of debt issuance by the domestic banking system. This implicit negative support intensified in the current sovereign debt crisis: we estimate that the absence of the backing of an AAA-rated government amounted, ceteris paribus, to an average increase in the funding cost of banks of over 140 basis points. However, once we restrict the analysis to banks for which CDS spreads are priced in the market – usually larger institutions which are more active in the bond market – we find that the bond premium reflects more closely the characteristics of each institution (soundness and creditworthiness), with the role of government somewhat reduced.

By distinguishing between banks' absolute size (total asset) and systemic relevance (being included in the Financial Stability Board list of global systemically important financial institutions, G-SIFIs), we find that financial investors were able to disentangle the two issues. Our results show that the larger the magnitude of the balance sheet, the lower the premium paid at launch on bonds. This in turn suggests that the safety net benefits granted to too-big-to-fail institutions encompass also lower funding costs on the primary bond market. At the same time, we find evidence of an investors' concern regarding the systemic relevance of financial institutions, most likely due less transparent business models and the involvement in activities less easy to price. Since the onset of the global financial crisis systemically important banks – which before the crisis were enjoying a reduction of the spread – paid, ceteris paribus, a larger premium on their bond issuance,

The paper is organised as follows. In Section 2 we describe the dataset and the econometric methodology. In Section 3 we analyse the factors influencing the yield at origination via a panel regression of the bond premia paid on the primary market over the period from 2006 to 2011. Section 4 concludes.

2. Methodology and data

In order to empirically assess the cost of bank bonds we propose a panel regression of the premium paid by banks on the primary market over the 6 years from 2006 to 2011. Since the risk-free component of the financing cost is unavoidable for the issuer, we focus on a market measure of the risk of debt issuance: 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. We do not follow the ASW spread evolution on the market after the day of issuance because the secondary market pricing of any debt security is a measure of the soundness and creditworthiness of the issuing institution in that moment but, from the point of view of the issuer, it does not change the cost of already placed bonds. In addition, the use of secondary market spreads is avoided because of the poor liquidity of the secondary market trading of some securities. Finally, yields on new issues reflect actual transaction prices rather than brokers' estimated prices. This approach, while reducing the time series dimension of the sample leads to large selection of bonds and issuing institutions. In doing so we follow the methodology used in the early contributions by Morgan and Stiroh (2001)

and Sironi (2003) for the banking sector, which has been recently applied to the debt issuance of non-financial corporations by Pianeselli and Zaghini (2014).

Our 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 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

	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. 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 of the sample paid an average of -10 basis points, the ASW spread started an increasing trend which led to a

[2] The full list of banks in our sample is reported in Appendix.

peak of 107 basis points in 2011. However, dynamics are extremely heterogeneous across countries. While many countries experienced a steady increase over time of the AWS spread (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. Finally, the UK is the only country in the sample for which the average ASW premium at bond origination declined in 2011.

A relevant aspect of the global financial crisis is that it induced significant substitution effects among financial instruments, also within the medium- to longer-term bond class. In fact, given the widespread change in risk assessment, the increase in interest rate spreads and the drying-up of several sources of funding (and the consequences of the sovereign debt crisis just few years later) there was a significant recast of the share of financial instruments employed by banks in their funding, especially at longer horizons (Cardillo and Zaghini 2012, ECB 2012). In addition, rescue plans by government, monetary authorities and supranational organizations, together with changes in market regulations, have also steered bank funding decisions and amplified the substitution effect among different securities with the same maturity (CGFS, 2011).

For instance, the exacerbation of the financial crisis which followed the collapse of Lehman Brothers in September 2008 led the governments of many advanced economies to use unprecedented amounts of state aids to support the financial sector. Among the most valuable tools there 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 of 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 October 2008 to May 2010 close to 1400 guaranteed bonds have been issued by approximately 200

banks from 17 countries, for an amount equivalent to more than €1 trillion (Lindh and Shich 2012).[3]

Table 2. ASW spread by type of deal

	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. Number of issuing banks in italics.

Moreover, the issuance of bonds was also affect, 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 and 40 billion euro, respectively (Beirne et al. 2011).

[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, South Korea, among others).

Table 2 reports the country issuance by type of bond. They can be distinguished in four deal types: covered bonds, government guaranteed bonds, senior bonds and subordinated bonds. While senior bonds are the bedrock of banks' issuance, also the other kinds of bond have been used by a large number of institutions. In fact, 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 spread than senior bonds (176 vs 77 basis points) and the two secured issuances being able to get a better price at origination: the ASW spread amounting to 45 basis points for covered bonds and 28 basis points for government guaranteed issuances.

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 bonds itself. In addition, we also take into account that the market pricing can be directly and indirectly influenced by the soundness of the sovereign. To disentangle the contribution of each group of variables we 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 characterizing the issuer (size, rating, CDS spread), V_k^{bond} are the variables of the bond features (volume, maturity, currency, rating), $V_i^{country}$ are the variables associated with the country of residence of the issuer parent (rating, geographic area), D_z^{market} are (yearly) time dummies which 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).

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

Note that 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]

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 (million 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 Strandard&Poors linearised between 0 (C-) and 25 (AAA). Banks 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.

Ceteris paribus, we expect that bonds with higher ratings 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 relation 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 bonds tends to be coupled by a higher yield due to the longer redemption horizon. Again, the sign of the coefficient is matter of empirical assessment.

As regards the size (total assets) of the banks we expect a negative sign, insofar as large banks are supposed to benefit of the implicit too-big-to-fail (TBTF) support by the government.

[5] As concerns 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 Strandard&Poors linearised between 0 (C-) and 25 (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; sovereign debt crisis 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; the pre-crisis dummy takes the value 1 in the period 2006Q1-2007Q3 and 0 otherwise.

In particular, the idea is that the government will not allow large financial institutions to go bankrupt when their failure would trigger significant disruptions into the domestic financial system. It is thus assumed that, because of the 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 since there is not an official commitment by the relevant authorities.[6]

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 has made clear how the turmoil following the failure of a single institution which was well connected and with large exposures on many market segments may spill over to several countries and pose a serious threat to the global financial stability.[7] The effect on the cost of funding of these large and complex institutions reflects two different circumstances which go in the opposite directions. On the one hand, the same reasoning about the size of the institution could be applied to other aspect which render a bank systemically important. The externalities associated with institutions which are perceived as not being allowed to fail due to their size may well be applied to interconnectedness, complexity, lack of substitutability or global scope. On the other hand, the balance sheet of such institutions, linked to a business model which generally places greater emphasis on trading and capital markets related activities, may have become less transparent. After the burst 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).

[6] While from the microprudential perspective the increase in balance sheet size may be a matter of concern, from the macroeconomic point of view, expansions of bank balance sheet (and private borrowing in general) are often viewed as a driver of the economy. However, recent studies signals that the relationship may be non-linear becoming weaker (or even negative) after a given threshold has been passed (Arcand et. al, 2012, Cecchetti and Kharroubi, 2012).

[7] Note that the IMF/BIS/FSB Report (2009) is the first official publication dealing with the systemic relevance issue. In particular, it provides 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 (BCBS; 2011) contains instead the methodology to identify the global systematically important financial institutions (G-SIFIs). Finally, the Financial Stability Board is in charge of publishing each year the G-SIFIs list.

3. The cost of bonds

The first column of Table 4 shows the basic regression: by looking at the bank characteristics we find, as expected, that the rating of the bank has a negative influence on the spread at launch: the better the rating, the lower the issuance cost.[8] At the same time, the size of the bank – measured as the number of employees – turns out to be non statistically significant at the usual confidence levels.[9] As for the issue features, the maturity at issuance of the bond is positively related to the cost, while the bond rating affects negatively the ASW spread at origination. The issuance of subordinated debt amounts 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 characteristics which is statistically significant is the euro denomination of the issue, which pays a spread worth 56 basis points less than other currencies, while the coefficient on the volume of the issue is not different from zero.

To take into account the country effects related to nationality of the issuer, we introduce a sovereign rating dummy variable,[10] the idea being that government of strong creditworthiness provide an implicit guarantee on the banking system of the country (Gropp et al. 2011). The variable turns out to be highly significant: bonds issued by banks from non AAA states pay 80 basis points more than banks with AAA-rated sovereigns.

We then add two other variables in order to consider: first, the distinctive features of the government guaranteed issues; secondly, the turbulences spilled over to the corporate bond market from the sovereign debt market starting from mid-2010 (Table 4, second column).[11] As for the former, the support of the public scheme can be measured in an average reduction in the issuance premium of around 32 basis point, while the increase in the ASW spread at launch due to the sovereign debt crisis is assessed in 33 basis points. However, these two coefficients do not consider the effect (negative or positive) of the

[8] The standard errors reported in Table 4 and Table 5 are clustered by country of residence of the issuer. The statistical significance of the coefficients is not affected when clustering by type of deals.

[9] We focus on the analysis of balance sheet size and systemic relevance of financial institutions in a later set of regressions.

[10] To take into account possible non-linearities in the relation, due in particular 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 we also used a linearised version of the variable.

[11] Note that the effect of all 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.

creditworthiness of the sovereign in those particular contexts. We thus interact the two dummy variables with the sovereign rating variable. Column 3 of Table 4 shows that indeed there are significant differences between AAA countries and the others. The explicit guarantee of a weak sovereign is worth 116 basis points less than the one from top-rated sovereign. Given the broad difference, this in turn suggests that it might well be the case that riskier banks with a lower rating but from sounder states could tap the bond market at a better price than sounder banks from weaker states. Thus confirming the finding in Levy and Zaghini (2011) and in Grande et al. (2011) that in the guaranteed bank debt market the security pricing strongly reflects the characteristics of the guarantor whereas bank-specific and issue-specific factors play only a minor role.

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 10%, 5% and 1%, respectively.*

From the regression coefficients we can also compute the value of the government support during the period of turbulence in the sovereign debt market. Our results show a significantly negative spillover from weak government to bank funding costs. In fact, during the sovereign debt crisis the backing of a lower than AAA-rated sovereign turns out to amount, ceteris paribus, to an increase of 143 basis points in the ASW spread paid at launch by banks headquartered in those countries.[12]

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 10%, 5% and 1%, respectively.*

[12] Given that - when looking separately at the effect of the sovereign debt crisis on AAA-rated countries and lower rated ones (Table 4, third column) - the "Sovereign Debt Crisis" variable is not significantly different from zero, the overall effect of a non-AAA rated government is given by the sum of the "Weak Sovereign Rating" variable (33 bp) and the interaction between the "Weak Sovereign Rating" and the time dummy "Debt Crisis" (110 bp).

In order to have a more detailed picture of the activity of bond issuance by banks and, at the same time, run a robustness check, we now restrict the sample to banks for which a CDS is priced, usually larger institutions which are more active on the debt market. The number of available bonds reduces to 1659, issued by 142 banks. Even though the sample reduction is sizable, we introduce in our empirical investigation an important quantitative variable describing the market perception of soundness and creditworthiness of each institution.[13]

The first column of Table 5 shows that the CDS coefficient is highly significant and with the expected sign: a deterioration of the perceived soundness of the bank (an increase in the CDS) leads to an increase of the cost of funding. By looking at the financial crisis period, we see that also for these institutions the cost of debt issuance is cheaper when accompanied by the public guarantee and more expensive during the sovereign debt crisis (second column). 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 bring an additional (negative) effect on the cost of guaranteed bank bonds. Second, as for the whole sample of banks, the sovereign debt crisis seems to affect only the issuers headquartered in the lower-rated countries, namely 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 caught by the CDS). In fact, if we compute the difference between the guaranteed issuance by banks in lower rated country and AAA-rated country the spread is only 47 basis points (the "Weak Sovereign Rating" dummy). On the other hand, the weakness of the sovereign significantly spills over to the home banking system during the sovereign debt crisis, the difference between top and lower rated countries amounting to 110 basis points.

As a further step of the analysis, we check for a relationship between banks' dimension/systemic weight and the premium paid on bonds by introducing in our 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 (2011) list of the 29 banks labelled as G-SIFIs).

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

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 Asset	**-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%, respectively.*

The first column of Table 6 shows that bank size has a negative coefficient, confirming that a larger size, consistently with the too-big-to-fail hypothesis, tends to induce lower funding costs. At the same time, the coefficient on 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, a different evidence emerges. The systemic relevance coefficient shows a significantly different behaviour in the period before the disruption of the US subprime market (2006Q1- 2007Q3) and during the global financial crisis (2007Q4-2011Q4). Before the crisis, the market assessment of systemically important banks is

benevolent: there emerges a large discount on the risk premia associated to bond issuance of G-SIFIs (62 basis points, Table 6 second column). The implications of the systemic relevance of financial institutions most likely have been reinforcing the TBTF argument. Yet, during the crisis, financial agents' mood toward those institutions changes direction: debt issuance occurs at a higher premium (37 basis points), suggesting the emergence of an active market monitoring. Thus our results support the hypothesis that market participants are now aware of the new framework in which G-SIFIs operates and opt for a more cautious approach when dealing with their debt. The burst of the crisis and, in particular, the demise of Lehman Brothers may have acted as a wake-up call for investors. Results are confirmed when estimating a richer econometric framework. Column 3 and column 4 on Table 6 show the FE panel estimations when we introduce the country fixed effects and the type of deal fixed effects.

Enhanced market discipline for banks of systemic relevance is also found by Bertay et. al (2013) which analyse 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 assumed as the index of systemic relevance of banks, or, in their words, as the indicator that banks have reached the too-big-to-rescue size.

As robustness checks of our results we restrict the sample to: 1) banks having a CDS only; 2) non-guaranteed issuances only; 3) non-subordinated debt only. Then we use several alternative definitions of G-SIFIs: the updated list provided by FSB (2012) which identifies 28 G-SIFIs, the merge of the two lists FSB (2011) and FSB (2012) which leads to 31 G-SIFIS, and the ranking provided by Masciantonio (2013) which replicate 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, we drop one of the two alternately in the regressions. We also employ a variable for the sovereign rating constructed with the same linearization applied to the rating of the issuer and the bond instead of the AAA dummy. Finally, we rely on different time windows for the definition of "financial crisis" and "sovereign debt crisis". Our findings about the sovereign influence and the difference between size and systemic relevance are not affected.

4. Conclusion

The paper provides an assessment of the determinants of the premium paid on bond issuance by banks in the US, euro area and the UK. We focus on a period (2006-2011) which includes the whole global financial crisis, started in the summer of 2007, which has evolved in a painful sovereign debt crisis in several euro area countries. The crisis has induced 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 of the perceived sovereign creditworthiness. In parallel with the home country worsening of funding conditions 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 we propose an empirical investigation of the risk premium at origination on 5,500 bonds. We find that the backing of an AAA-rated sovereign provides an important implicit support to the home banking system, while weaker governments increase the funding cost of banks. This effect exacerbated in the most recent period of sovereign debt crisis: we estimate that the absence of an AAA-rated government implicit support amounted, ceteris paribus, to an increase of 143 basis points in the ASW spread paid at launch by domestic banks. In addition, in line with the recent literature on government guaranteed bank bonds, we observe that the security pricing of explicitly guaranteed debt reflects by a large extent the soundness of the sovereign. Yet, when looking at banks having a CDS – usually institutions which tap bond market more regularly – we find that the premium required by investors is more closely related the characteristics of each bank, with the sovereign role partially downsized.

By focusing on balance sheet dimension and complexity, we investigate whether size and systemic relevance of financial institutions make a difference in banks' funding conditions. In particular, we assess whether financial investors are able to disentangle the two issues and whether there is evidence of a limited monitoring or an enhanced market discipline. Our results suggest that indeed the size of the bank is negatively associated to the cost of bond financing, thus expanding the list of the safety net benefits of too-big-to-fail institutions to a reduced premium paid on the primary debt market. At the same time, we

find evidence of enhanced market discipline of systemically important banks, since the G-SIFIs selected by the Financial Stability Board faced an increased premium on their debt issuance. Given the length of the global financial crisis and the turmoil which followed the demise of Lehman Brothers, it seems that market sentiments have shifted towards a closer scrutiny of large and complex financial institutions and a different perception of their risk has emerged. In fact, bond holders may consider more likely than before their involvement in case of a managed bail-in. At the same time, it might well be that once the cross-border supervisions of G-SIFIs will be fully in place, with capital adequacy ratio surcharges and coordinated recovery and resolution plans, financial market will differently assess the risk of such institutions.

All in all, our findings suggest that the linkages between the sovereign and the home banking system significantly affect banks' cost of funding, in particular in crisis periods. While rescue plans by governments and supranational authorities together with unconventional monetary policy measures have successfully supported bank funding during the crucial phases of the crisis, furthers interventions aimed at consolidating public finances, supporting economic growth and strengthening banks' capital cushions are still needed to fully regain investor trust and avoid vicious cross-country contagion effects. At the same time the size and the complexity of many financial institutions is inducing a reassessment of the rules under which they operate with the aim of making the failure of G-SIFIs less likely and the impact of their bankruptcy less widespread and costly.

Annex

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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