DETERMINANTS OF BANKS' FINANCING COSTS IN THE BOND MARKET*

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Abstract

In the recent past, the bond market has become an important financing source for some European banks. The costs of such funding source differ significantly between institutions, as well as throughout time. As a consequence, it is important to identify the determinants of this variability. The monitoring of spreads over time allows for the estimation of potential funding costs in bond markets for each bank. In order to empirically assess the determinants of such variability, an extensive database was built, containing information on the characteristics of each issue and each issuer, as well as on the evolution of secondary market spreads of each security through time. Database exploration allowed us to conclude that longer residual maturities and subordination clauses are associated with higher spreads. In turn, higher issue amounts and the existence of collateral work in the opposite sense. In what concerns the profile of the issuer, it was observed that higher solvency, liquidity and efficiency levels are positively evaluated by the market, yielding lower spreads. Finally, we studied the impact of macroeconomic conditions on the time evolution of spreads, concluding that spreads tend to increase in periods with higher long-term interest rates and in periods of economic slowdown.

1. Introduction

The bond market has become one of the main financing sources of many European banks. However, the costs underlying such funding differ significantly across banks, as well as throughout the economic cycle. It is thus important to understand which factors determine such variability. As a consequence, the main goal of this study is to analyse the factors that determine the spreads on fixed rate bonds issued by European banks, taking into account specific characteristics of each issue and of each issuer, the latter obtained from the financial statements of issuer banks.

The funding cost in the bond market can be approximated by the difference between the yield of each bond and the yield of a Government bond with equal (residual) maturity (which is assumed to bear nil or constant credit risk). The assessment of this spread at the date of issue is useful, reflecting the borrowing cost at that moment. However, it is also interesting to evaluate the evolution of the spreads for each security throughout time (in the secondary market), given that this information allows for an estimate of the cost the issuer would support if it issued a new bond with similar characteristics (in other words, the spread in the secondary market allows for the estimation of potential funding costs).

The monitoring of the assessments performed in the markets can be very useful from the financial stability viewpoint, as there is evidence that some market indicators may embody valuable information to anticipate future developments in banks' financial situation. Gropp et al (2002) study the predictive power of some market indicators on the financial fragility

* The opinions in this article represent the views of the authors and are not necessarily those of the Banco de Portugal. The authors would like to thank António Antunes and Nuno Ribeiro for their helpful comments and suggestions. Any errors or omissions remain our own.
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of European banks, concluding that such indicators may help to predict possible deteriorations in banks' financial situation.

The rest of the work will be structured as follows: Section 2 analyses possible determinants of private debt spreads, namely in what concerns bank debt, taking into account some of the contributions found in the literature. Section 3 presents the data used in the estimation of the econometric models chosen to analyse the determinants of European banks bonds' spreads. Section 4 summarises the methodology applied, while section 5 analyses the main results. Finally, Section 6 concludes.

2. Determinant factors of private debt spreads

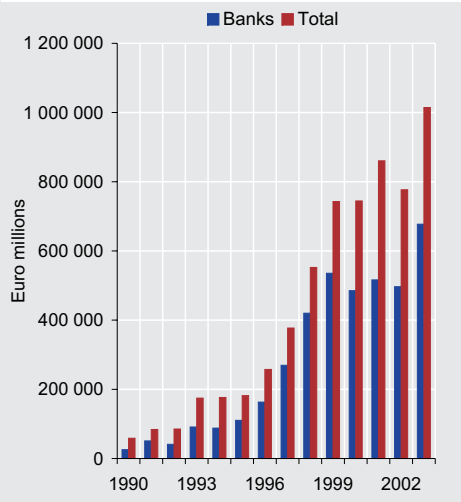
Part of the variability in spreads is probably related to the specific characteristics of the issue. Therefore, those factors should be considered in the investigation of the elements that play a part in the determination of the funding cost in debt markets. For instance, the residual maturity of the security may significantly influence the spreads. For instance, Landschoot (2004) finds, for a sample of European bonds, that spreads increase in line with the residual maturity of the securities, as a longer maturity may imply a higher default risk. The issue amount may also be a determining variable for the price of the bond. Sironi (2003) points out this idea, as the amount of the issue can influence its liquidity in the secondary market. As the European banks' bond market has not yet reached a liquidity level comparable with that of the USA, this factor should also be considered in the analysis. In addition to the factors already mentioned, the existence of collateral and of subordination clauses may affect the credit risk of the issue and, as a consequence, the spread vis-à-vis riskless debt securities. The rating of the issue may also condition its price. However, the issuer's rating may be more representative of the global risk of the issuer and, as such, it may be more relevant than the specific rating of the issue. It should be noticed that the simultaneous use of both variables could generate collinearity problems. Sironi (2003) points out significant correlation between these variables, noting that, on average, issue ratings are relatively lower than those of the issuer, particularly for subordinated securities.

Controlling for the effect of the above-mentioned specific characteristics of each issue, this article looks for an assessment of which characteristics of issuers are more relevant in the determination of funding costs. In this domain, there is ample literature on the factors determining spreads in bonds issued by corporations, particularly for US non-financial corporations. Some recent empirical contributions in this field are Collin-Dufresne *et al* (2001), Elton *et al* (2001) and Anderson and Sundaresan (2000). Landschoot (2004) also adds on the topic, considering bonds issued by European corporations. Still, besides being important to know, in general, the factors determining the spreads on bonds issued by firms, it is also important to assess the factors determining the spreads on bonds issued by banks. There are three main reasons to perform such analysis. Firstly, banks have increasingly resorted to bond funding during the last years, particularly in the euro area[1] (Chart 1). Secondly, considering the specificity of banks' activity (namely their possibility to, by definition, have access to alternative funding sources, and their prominent role in debt markets), it can be expected that their determinants of funding costs can be different from those of non financial corporations. Elton *et al* (2001) find significant differences between the spreads of bonds of the financial and non-financial sectors, as well as in their time structure. The authors justify such differences with different sensitiveness of bonds issued by these sectors both to systematic factors as well as to idiosyncratic shocks. In fact, the simple existence of an explicit and mandatory regulatory framework applied to

1. Bondt (2004) analyses the factors underlying the recent developments in this market.

CHART 1

EVOLUTION OF THE VOLUME OF BONDS IN THE EURO AREA



SOURCE: Bondware.

most financial institutions implies a different sensitiveness of the financial system to these factors. Finally, some recent studies analyse the effect of market discipline on banks through the way markets value banks' subordinated debt (see Evanoff et al (2001 a,b), for the US, and Sironi (2003) for a sample of European banks).

Considering the several contributions mentioned above, one can point five groups of variables which can help explain differences in spreads across different banks: i) asset quality; ii) capital structure; iii) liquidity; iv) solvency; v) profitability. A sharp decrease in banks' asset quality may contribute to an increase in bond spreads. In turn, a high degree of leverage, as well as deterioration in banks liquidity, may imply an increased difficulty to meet short-term liabilities, something that the market may price negatively. High solvency ratios may be positively valued and, finally, a decrease in profitability may signal some deterioration in banks' financial situation (even though extremely high profitability levels may imply higher spreads, in case they are associated with excessive risk taking). It should be noted that some of these variables might be significantly correlated. As a consequence, even though all these variables can be considered theoretically relevant for the determination of spreads, they might not be simultaneously considered in econometric modelling, as this could lead to spurious results, due to multicollinearity problems.

In addition to the investigation of issue and issuer characteristics as determinant factors of banks' bond spreads, it can also be interesting to explore the influence of macroeconomic variables on the funding costs of banks. On the one hand, the global evolution of interest rates should significantly condition the spreads in bond markets. Available empirical evidence suggests that a decrease in interest rates should be accompanied by a reduction in spreads (i.e., the lower the level of interest rates, the lower tends to be the difference between private and public funding costs (see, for instance, Duffee (1998)). On the other hand, the stance of economic activity may also play a determining role in the dynamics of spreads throughout time. During an expansion period, spreads will tend to decrease, signalling a global reduction in the risk associated with debt issuers, as economic agents tend to have a positive perception on the future economic situation in such periods. In turn, during a recession, default risk may increase significantly, which may translate into

higher spreads. For instance, Santos (2003) finds that the inclusion of a binary variable identifying recession periods allows for better results when modelling the access of firms to the bond market. Nevertheless, it is important to consider that the sensitiveness of the spreads to business cycles shall be much higher for lower rated issuers than for those with lower credit risk (Crouhy *et al* (2000) underline the importance of considering these different types of sensitiveness in credit risk modelling). In this sense, though spreads on banks' bonds may reveal some sensitiveness to the cyclical position of the economy, it should not be as significant as that of lower-rated non-financial corporations, given that most European banks have relatively high rating notations.

3. Data

The starting point in building up the database used in our empirical analysis was collecting information on bond issues performed by European banks between 1999 and 2003. The definition of the beginning of the sample period was associated with the establishment of the European Monetary Union, which generated sizeable structural changes in securities markets. Namely, from 1999 onwards, the volume of bonds issued by European banks increased significantly. Furthermore, taking into account solely bonds issued after 1999, we can restrict our database to bonds issued in euros, what avoids having to take into account exchange rate market factors (which may have a determinant impact on the evolution of bond spreads). Data on bond issues and their characteristics were obtained from Dealogic Bondware. Information was collected for all issues of banks from euro area countries. The database was constructed solely with fixed rate bonds (excluding not only variable interest rate bonds, but also convertible bonds), in order to make the computation of bond spreads simpler. For each issue, it was gathered information concerning the issuer, issue and issuer rating, maturity, subordination clauses, collateral, amount issued and spread at issue date. We collected information on 10.322 bonds.

As previously mentioned, the secondary market spread may be more informative than the spread at issue date for two main reasons. On the one hand, by taking into account the spread in secondary markets, one is forced to consider just bonds with some liquidity, what makes possible to analyse how market participants price the risk underlying a given security. On the other hand, the spread in the secondary market may be a proxy for the evolution of potential funding costs in bond markets over time, given that such spread should be close to the cost the bank would have to support to issue a new bond with similar characteristics at that moment. In order to calculate these spreads, information was collected from Bloomberg for all securities identified in Bondware. For a large part of the initial sample of bonds, regular information on its yield to maturity was not available. In most cases there was no information at all and, in some other cases, the information was sparse and irregular, reflecting in part the relatively low liquidity of euro area bond markets during the period under analysis. Taking into account only bonds that had a relatively regular pricing in secondary markets, it remained a sample of 4.253 bonds. For these bonds, the spread was computed as the difference between its yield to maturity and the yield on German government bonds. The spread was computed vis-à-vis the government bond with the closest maturity, using a linear interpolation procedure to construct a full maturity spectrum.

The last step in the construction of the database was to gather information from the issuer banks' financial statements. Detailed financial information was collected on 137 euro area banks from Bankscope. The information collected was as detailed as possible, in order to allow for econometrically testing several plausible theoretical hypothesis. Given that for a small part of the sample it was not possible to retrieve information from Bankscope, from

the crossing of these two databases resulted 4.161 bonds, on which the empirical analysis will be focused. For each of these bonds, the database contains information on issue characteristics, accounting and market information on the issuer, as well as the evolution of the spread through time. As a result, this database constitutes a very extensive information source on bonds issued by European banks since 1999.

Given that most banks' financial information is available only on an annual basis, we considered annual, half-year and quarterly averages of bond spreads. Taking into account all these averages (with or without time lags), it was concluded that the most robust and significant relationship is usually established between the spreads annual average and variables from the financial statements in the same year. This may be associated with the fact that market participants are, to some extent, forward-looking agents, reflecting gradually in the spreads information released throughout the year, which ends up being summarised, in some way, in end-of-year financial statements.

There is just an additional note regarding the treatment of rating information. Given that there is information available from three different rating agencies, which have different (non-numeric) scales amongst them, it was constructed a correspondence between each of these scales and a numeric scale from 1 to 23 (in which 23 is the best rating notation possible).

In Table 1 there is a brief statistical summary of some of the variables considered in the sample. The analysis of standard deviations suggests that there is considerable time and cross-sectional variability in the sample. As can be seen in the table, the number of observations for each variable varies widely. There is less information available for issuers than for their respective bond issues. Such reality conditioned the integration of some information dimensions in econometric modelling, most notably in what concerns the analysis of the impact of asset quality on bond spreads.

Nearly 85 per cent of the bonds in the sample were issued by German banks. Therefore, the conclusions of this study are to a large extent dominated by the characteristics of German banks and of their issues. In what concerns issue characteristics, it should be mentioned that most German bonds do not have subordination clauses, what may help to explain the relatively lower spread levels of these bonds (in line with what is seen for Belgium and the Netherlands)[2]. Finally, it is also worth mentioning that during the sample period there was a gradual convergence of bond spreads from different euro area countries (as can be observed in Chart 2)[3].

2. For Germany, in 2004, 98 per cent of the bonds issued by banks had no subordination clauses (96 per cent for the full sample period).

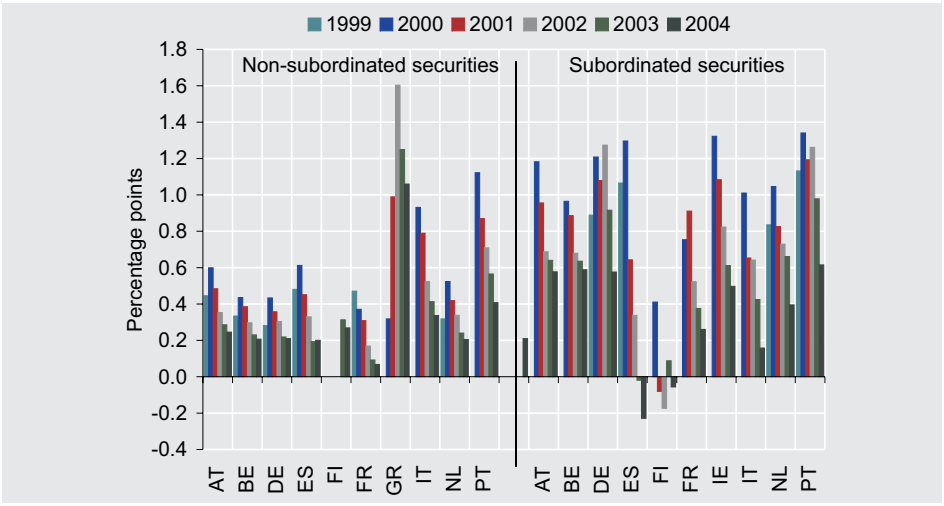
3. Bonds issued by Portuguese banks have relatively high spreads during the period under analysis. However, during this time span there was a remarkable convergence towards the euro area average. Hence, in 2004, the average spread for Portuguese bonds was 0.41 p.p., what compares with 0.21 p.p. for the whole sample (for subordinated bonds, the spread for Portuguese issuers was 0.62 p.p., compared with 0.39 p.p. for the entire sample). It should be noticed, however, that Portuguese banks issue mostly variable interest rate bonds. Given that our database includes only fixed rate bonds, there is a very limited number of observations for Portuguese banks (only 10 bonds). Finally, even though average issue amounts are slightly higher for Portuguese banks than for the rest of the sample, these banks are, on average, smaller than most banks considered in the sample. Portuguese banks have, on average, relatively higher profitability and efficiency levels.

TABLE 1

SUMMARY STATISTICS FOR THE FULL SAMPLE

	Number of obs.	Average	Standard--deviation	Min.	Max.
Issue amount	24942	224.3	404.0	0.1	5000
Final coupon	24942	4.1	1.2	0.0	17
Year	24966	2002	1.7	1999	2004
Spread q1	10666	0.30	0.3	-2.0	6.7
Spread q2	11419	0.28	0.3	-2.2	9.3
Spread q3	8719	0.32	0.3	-1.8	8.7
Spread q4	9491	0.31	0.3	-2.1	10.5
Spread h1	11702	0.29	0.3	-2.1	7.8
Spread h2	9858	0.32	0.3	-2.0	9.2
Annual spread	13710	0.29	0.3	-2.1	8.4
Number of employees	16429	8629	14075	2.0	126757
Total assets	18084	168387	132382	157	927918
Customers' and short-term liabilities	18001	97033	92148	0	506738
Interest rate margin	18084	1443	1472	-2125	10313
Net income before taxes	18084	389	843	-2862	13969
Prov. cred. overdue as % int. rate margin	17773	28.7	33.0	-41.4	524.7
Credit overdue over gross credit	1958	2.4	2.2	0.0	15.2
Write-offs as % gross credit	733	2.5	5.8	0.0	29.9
Tier 1 ratio	11762	7.1	4.2	4.3	86.9
Capital ratio	11933	10.9	4.3	6.1	87.9
Capital as a % of assets	18080	2.5	11.4	-749.7	93.2
Capital as a % of credit	17978	6.3	12.6	0.1	932.2
Capital as a % liabilities	18048	2.6	2.7	-94.6	123.1
Subordinated debt as % own funds	17132	27.4	7.9	0.0	65.5
income	18084	259	706	-2229	13513
Credit	17981	71840	53230	0	345330
Net income as % average assets	18084	0.7	1.3	-73.8	6.8
ROA	18084	0.2	0.8	-2.9	48.5
ROE	18084	4.5	12.2	-110.0	144.0
Dividend pay out	14008	30.3	35.5	-184.4	835.3
Cost to income	18015	55.4	18.9	6.6	183.3
Net assets as % cust. and short-term liab.	17966	78.6	89.0	0.0	602.0
Net assets as % deposits and funding	18015	24.2	9.6	0.0	130.5
Market capitalisation	3009	11220	15616	72	210278
EPS	3009	0.6	4.6	-20.8	48.4
PE close	3009	13.0	11.9	-15.0	293.1
Subordinates (Y/N)	24966	0.0	0.2	0	1
Average issue rating	18294	22.6	1.1	16.0	23.0
Collateral (Y/N)	24966	0.9	0.3	0	1
Average issuer rating	17934	20.1	2.8	15.0	23.0
Change in share prices	2315	-0.2	0.2	-0.7	0.5
Residual maturity	23735	5.9	3.6	0.0	34.2
10-year interest rate	24966	4.7	0.5	4.2	5.4
GDP (growth rate)	20805	1.8	1.3	0.7	3.9
For Portuguese bonds:					
Issue amount	60	243.5	140.5	20	400
Annual spread	39	0.86	0.3	0.3	1.4
Total assets	48	38578	20581	6803	67685
Capital ratio	48	9.9	1.0	8.1	11.7
ROA	48	0.9	0.4	0.2	2.1
Cost to income	48	61.1	6.0	51.5	72.1
Net assets as % cust. and short-term liab.	40	11.5	4.4	3.8	18.5
Residual maturity	60	7.5	2.6	0.9	12.1
For German bonds:					
Issue amount	21630	204.2	392.1	2.5	5000
Annual spread	11918	0.29	0.3	-1.3	8.4
Total assets	15384	161367	121152	157	927918
Capital ratio	10061	10.5	2.0	7.7	23.6
ROA	15384	0.1	0.4	-1.3	8.6
Cost to income	15342	54.7	18.9	13.4	183.3
Net assets as % cust. and short-term liab.	15344	87.5	93.2	0.0	602.0
Residual maturity	20501	5.7	3.4	0.0	34.1

CHART 2
AVERAGE SPEADS BY COUNTRY



4. Methodology

In order to identify the factors that contribute to the determination of spreads in the bond market, we resorted to an econometric model of the type:

$$Spr_{i,t} = a + \sum_{j=1}^{n} b_j v_{j,i,t} + Dum_t + v_{i,t}, \text{ where}$$

$Spr_{i,t}$ stands for the spread of issue *i* at moment *t*

$\sum_{j=1}^{n} b_j v_{j,i,t}$ stands for the joint effect on the spread of issue *i*, at moment *t* of the *n* variables considered in each model, and

Dum_t stands for the dummy variables for each of the periods (years) considered in the estimation and, in one of the specifications, for each of the issuers.

This model allowed for the successive testing, both in isolated and combined way, of the importance of explanatory variables associated with issue features, with the characteristics and performance of the issuer and with macroeconomic variables, such as GDP growth or risk-free interest rates. The inclusion of dummy variables for each year captures the effects of the factors that affect simultaneously all bonds, even though in a different way through time. The modelling setup reflects to a large extent the restrictions imposed by data availability, in what concerns both the time span covered and the frequency of the data available for most explanatory variables.

The model was estimated using pooled OLS. In most regressions, a clustering procedure was applied, based on the pair (issuer, year). Such procedure, with no impact on the estimates of the coefficients associated with the regressors, takes into account that observations are independent between groups, but not necessarily within groups. Therefore, this clustering procedure conditions standard error estimates as well as the variance and co-variance of the estimators. It was also evaluated the possibility of exploring the database under a panel data setup. However, given that there are, on average, only 2 years of observations for each bond, the use of fixed-effect estimators does not offer sizeable ad-

vantages when compared with alternative estimation techniques, most notably if the clustering procedures mentioned above are applied.

5. Results

As previously mentioned, the methodology adopted allowed us to test the empirical significance of a set of factors, some of them associated with the issue characteristics, others with the performance and features of the issuer and, finally, others regarding overall economic developments (namely in what concerns economic growth and short and long-term interest rate levels). Table 2 summarizes the main results obtained.

The theoretical importance of most variables considered is supported by the results obtained in the regressions. For instance, when taking into account solely variables strictly related to issue characteristics, it is possible to conclude that bonds with longer residual maturities and with subordination clauses show relatively higher spreads: for each additional year of residual maturity, there is a premium of nearly 2 basis points (b.p.), whereas the inclusion of a subordination clause may imply an increase in the spread of 30 b.p. In the opposite direction, the presence of collateral and higher issue amounts contributes to a reduction in spreads. The results also support the idea that better rated issues imply lower financing costs for banks in bond markets[4].

When taking into account the specific characteristics of the issuer, it is possible to conclude that the theoretical assumptions regarding the effects of solvency and liquidity on spreads are not rejected. In other words, a higher ability to withstand unexpected losses and to guarantee short-term liabilities is priced by markets in a positive way, yielding lower spreads (for instance, for each additional percentage point in the solvency ratio, the spread should decrease by 0.2 b.p.[5]). In addition, more efficient issuers (with lower cost to income ratios) usually benefit from lower funding costs (similarly to solvency and liquidity indicators, the multiplier associated with this ratio, despite being significant, is relatively low (0.1 b.p.)). This variable can be regarded as a proxy for profitability[6]. Other profitability variables were tested, but none showed up to be significant. Further, leverage variables also did not display significant coefficients in the estimations performed. Such result may be perceived in two different ways: on the one hand, it can reflect the presence of collinearity problems between these leverage and solvency variables or, on the other hand, it can imply that, for the banking sector, market participants may consider that the observance of regulatory capital requirements is relatively more important in the assessment of a bank's financial situation. The results concerning asset quality are not presented given that, in our opinion, the reduced number of observations for these variables should not be sufficient to justify their inclusion in the set of explanatory variables. All in all, the results obtained regarding the significance and magnitude of variables associated with the issue and the issuer are robust when taking them simultaneously into account, increasing in a substantial manner the explanatory power of the model.

Similarly, the inclusion in the set of explanatory variables of macroeconomic indicators does not change the explanatory power nor the coefficients associated with issue and is-

4. It should be stressed that the latter result is obtained in a modelling setup relatively different from the others, namely in what concerns the clustering procedure. In this regression, it is not considered the clustering based on the pair (issuer, year). Instead, it is considered a dummy variable for each issuer, in order to group observations by their issuer.
5. The relatively low value of this multiplier can in part be explained by the fact that banks usually operate with solvency ratios above the regulatory minimums.
6. In this specification it was taken into account a dummy variable for German issuers. Without the inclusion of such variable, the solvency ratio is not significant at a 10 per cent confidence level. This can reflect the fact that German banks have, on average, relatively low solvency ratios (and with low dispersion), in spite of presenting lower spreads than the rest of the sample.

TABLE 2

MAIN RESULTS

	Issue		Issuer	Issue and issuer	Issue, issuer and macro variables		
	1	2	3	4	5	6	7
Residual maturity	0.018	0.025	0.027	0.021	0.021	0.021	0.021
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Issue amount (log)	-0.028	-0.014		-0.027	-0.027	-0.028	-0.026
	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)
Collateral (Y/N)	-0.055			-0.063	-0.062	-0.064	-0.062
	(0.00)			(0.00)	(0.00)	(0.00)	(0.00)
Subordinated (Y/N)	0.300	0.257		0.332	0.333	0.333	0.348
	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)
Issue rating		-0.022					
		(0.00)					
Tier 1 ratio			-0.003	-0.002	-0.002	-0.002	-0.002
			(0.04)	(0.06)	(0.06)	(0.06)	(0.11)
Net assets as % cust. and short-term liab.			-0.003	-0.001	-0.001	-0.001	-0.002
			(0.01)	(0.03)	(0.02)	(0.04)	(0.02)
Cost to income			0.001	0.001	0.001	0.001	0.001
			(0.05)	(0.08)	(0.10)	(0.09)	(0.08)
3-month interest rate – euro area						0.037	
						(0.05)	
10-year interest rate – euro area					0.133	0.069	
					(0.00)	(0.04)	
National GDP (growth rate)							-0.031
							(0.10)
Dummy Germany			-0.060				
			(0.06)				
Control variables	Year dummies	Issuer dummies	Year dummies	Year dummies			Year dummies
Constant	0.369	0.814	0.199	0.350	-0.237	-0.066	0.419
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.58)	(0.00)
Methodology	pooled OLS with clusters	pooled OLS	pooled OLS with clusters	pooled OLS with clusters	pooled OLS with clusters	pooled OLS with clusters	pooled OLS with clusters
R^2	0.21	0.31	0.23	0.32	0.31	0.31	0.32
P-value F test	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Number of observations	13 648	9 913	5 756	5 751	5 751	5 751	5 751

NOTE: p-value between parenthesis.

suer variables. We estimated three distinct models, taking into account short and long-term euro area interest rates and GDP growth rates for each euro area country in the sample. Overall, the results obtained are consistent with what is suggested by economic theory. In fact, a higher interest rate level should be associated with higher spreads (model 5), whereas the (contemporaneous) growth in GDP should favour its reduction

(model 7). Finally, a higher (positive) slope in the yield curve (defined as the difference between long and short-term interest rates) is also associated with a reduction in those spreads (model 6)[7]. It should be stressed that the slope of the yield curve is a variable that theoretically and empirically finds some support as a proxy for expectations on future economic developments.

6. Conclusion

During the last few years, euro area bond markets have become an important funding source for European banks. The possibility of obtaining funds with relatively long maturities in increasingly deep securities markets makes this opportunity relatively attractive for banks, as well as for those offering such financing.

This work intended to empirically examine some of the factors that may contribute to the determination of banks' funding cost through bond issuance by taking into account three variable dimensions. Firstly, we explored the impact that specific issue characteristics might have on the spread. A longer residual maturity may account for a relative increase in spreads. Further, the introduction of subordination clauses should have a similar effect. In turn, higher issue amounts and the presence of collateral seem to work in the opposite direction, implying a decrease in spreads. Secondly, we evaluated the impact of issuer characteristics on its relative financing cost in bond markets. In this domain, we looked at five sets of variables: asset quality, leverage, liquidity, solvency and profitability. However, after testing several alternative specifications, it was concluded that not all of these variables are significant in determining financing costs in bond markets. In fact, controlling for the residual maturity of each bond, we concluded that high solvency, liquidity and efficiency levels (efficiency can be regarded as a proxy for profitability, to some extent) are positively evaluated by market participants, yielding lower spreads. Finally, taking simultaneously into account issue and issuer features, we added macroeconomic variables to our analysis, given that they may also affect banks' funding costs. This specification confirms our previous conclusions regarding issue and issuer characteristics. Furthermore, this additional specification suggests that funding costs in bond markets tend to increase during periods of higher (long-term) interest rates (what should also imply an increase in the cost of capital and, hence, in the cost of alternative funding costs), as well as in periods of economic slowdown (observed or expected).

The construction of the database that supports this study allowed us to identify and quantify some of the factors that affect the cost banks have in obtaining funding through bond markets. Such analysis makes it possible to identify which characteristics of the issue and, most notably, of the issuer market participants perceive as implying higher risk levels, demanding, as a consequence, a higher premium in the transaction of such securities. Further research on this topic may include an extension of the sample period or the inclusion of higher data frequency, in order to make it possible, for instance, to perform sensitivity tests in situations of increased instability. However, increasing data frequency makes more difficult the use of issuer characteristics, given that for most banks only annual financial statements are available. Another possibility would be to consider bonds issued before 1999, in order to analyse a complete business cycle. Such extension of the sample period would allow to characterize more accurately instability periods, as well as to understand if there is any change in the factors that determine banks' funding costs in such pe-

7. In fact, it should be noticed that equation 6, with the functional form *spread = f(..., s, l)*, can be re-written as *spread = f(..., l, l-s)*, in which *s* stands for the short-term interest rate and l stands for the long-term interest rate.

riods[8]. However, the bond market in euro area countries went through deep structural changes since 1999, what can undermine some comparisons in different years.

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8. In the period under analysis, it was not possible to find any evidence that supports the hypothesis that the above-mentioned determinant factors change in periods of increased instability (defined as periods in which occur sudden and widespread increases in spreads). This may be, in part, associated with the frequency of available data.

APPENDIX

SUMMARY STATISTICS OF THE VARIABLES USED IN THE FINAL SPECIFICATION

Full sample	Average	Standard--deviation	Min.	Max.
Annual spread	0.3	0.3	-2.1	8.4
Issue amount	224.3	404.0	0.1	5000.0
Residual maturity	5.9	3.6	0.0	34.2
Collateral (Y/N)	0.9	0.3	0.0	1.0
Subordinated (Y/N)	0.0	0.2	0.0	1.0
Tier 1 ratio	7.1	4.2	4.3	86.9
Net assets as % cust. and short-term liab.	24.2	9.6	0.0	130.5
Cost to income	55.4	18.9	6.6	183.3
10-year interest rate	4.7	0.5	4.2	5.4
GDP (growth rate)	1.3	1.2	-1.1	11.1
Sample used in the estimation	**Average**	**Standard--deviation**	**Min.**	**Max.**
Annual spread	0.3	0.2	-1.1	4.2
Issue amount	254.6	389.9	0.1	5000.0
Residual maturity	5.0	2.8	0.0	30.5
Collateral (Y/N)	0.9	0.3	0.0	1.0
Subordinated (Y/N)	0.0	0.2	0.0	1.0
Tier 1 ratio	7.3	3.7	4.3	84.3
Net assets as % cust. and short-term liab.	27.5	9.1	0.2	59.2
Cost to income	61.3	15.2	6.6	104.4
10-year interest rate	4.8	0.4	4.2	5.4