

Pablos Nuevo, Irene

Working Paper

Has the new bail-in framework increased the yield spread between subordinated and senior bonds?

ECB Working Paper, No. 2317

Provided in Cooperation with:

European Central Bank (ECB)

Suggested Citation: Pablos Nuevo, Irene (2019) : Has the new bail-in framework increased the yield spread between subordinated and senior bonds?, ECB Working Paper, No. 2317, ISBN 978-92-899-3886-0, European Central Bank (ECB), Frankfurt a. M., <https://doi.org/10.2866/374056>

This Version is available at:

<https://hdl.handle.net/10419/208351>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



EUROPEAN CENTRAL BANK
EUROSYSTEM

Working Paper Series

Irene Pablos Nuevo

Has the new bail-in framework increased the yield spread between subordinated and senior bonds?

No 2317 / September 2019

Abstract

This paper investigates the impact of the introduction and implementation of the new EU bail-in framework on the banks subordinated bond yield spreads over senior unsecured bonds, and links the bond yields developments with the characteristics of the issuing entities and the economic and financial environment. The analysis does not show evidence of a significant and generalized increase in the spreads as a result of a higher risk perception in the sample under review. The results reinforce the relevance of the Tier 1 capital ratio for making subordinated debt safer, while markets price the higher risk of banks with less stable sources of funding in their liability/capital structures. Market conditions and economic environment variables also play a key role in explaining bond spreads. Interestingly, after the introduction of the new bail-in framework, there is a convergence between the bond yields of the GSIBs and the non-GSIBs, which could point out to a reduction in the market perception of the so called “too big to fail” public implicit guarantee. Nonetheless, this convergence is mostly driven by the reduction of the yields of bonds issued by banks not categorized as GSIBs, and not by significant increases in the GSIBs’ bond yields.

JEL classification: G12, G14, G28

Keywords: Bank bond yields, bail-in, too big to fail

Non-technical Summary

The entry into force of the BRRD has increased the role of bank subordinated debt as a loss absorption instrument and has blurred some boundaries between the characteristics of funding and capital. In particular, the relevance of the BRRD for the market pricing of subordinated debt is twofold: it makes explicit the subordination hierarchy to absorb losses in case of bail-in, which could increase investors' perceptions of the riskiness of subordinated bonds; and raises the need for some institutions to issue subordinated debt to comply with the minimum requirements of own funds and eligible liabilities (MREL). The two effects could raise concerns about the capacity of the market to absorb the new issuance without increases in the costs.

The aim of this document is to analyse if the subordinated bond yield spreads against senior unsecured bonds have increased after the introduction or the implementation of the new bail-in regulation, and link the bond yields developments with the characteristics of the issuing entities and the economic and financial environment. By comparing subordinated bond against senior bond yields the resulting indicator is a proxy for the additional cost of the more junior debt, which in turn can be included in the Tier 2 capital and the loss absorption capacity (subordinated debt) under certain criteria, against other unsecured debt with characteristics more related to funding (senior debt).

The empirical analysis focuses on a panel of 41 EU credit institutions, for the period 2014Q4-2018Q2, with debt issuance and balance sheet data at the consolidated level. Bond yields are retrieved from Markit Iboxx, a dataset which provides indices for subordinated bonds and senior bonds at the firm level following a set of comparability and quality checks in the raw market data. The firm-specific explanatory variables of the bond yield spreads are obtained mainly from the Orbis Bank Focus database, and reflect solvency, balance sheet structure, size, asset quality, profitability and business model. The study also takes into account indicators that capture the market conditions or the economic environment in which banks operate, namely overnight interest rates, the volatility of the Euro Stoxx banks index and economic growth prospects. Likewise, when examining the impact of the entry into force and the implementation of the new bail-in regulation, the analysis considers other characteristics of the banks, such as their classification as Global Systemically Important Institutions (GSIBs), business model and country of origin.

The analysis does not show evidence of a higher risk perception in the sample under review. In 2016, the year of the entry into force of the new bail-in regime, senior bond yields of the

banks in the sample generally declined, while the distribution of the subordinated bond yields did not show a statistically significant change. The new bail-in rules might have reduced the probability of default of senior debt in 2016, by providing with early intervention tools and a framework that allows senior bondholders to be relatively well protected against losses in case of failure. Subordinated bond yields did not show a statistically significant change in 2016 probably because the effect of the BRRD was already anticipated by the European Commission's 2013 Communication on State Aid to banks. In addition, spillovers from the ECB Corporate Sector Purchase Programme (CSPP) and other monetary policy measures might have narrowed the spreads not only for CSPP-eligible bonds, but also for non-eligible bonds for purchase under the CSPP owing to the portfolio rebalancing channel. Other factors, such as the build-up of capital and de-risking following the Basel III implementation, may have led to a general decline in subordinated and senior bond yields while keeping the spreads relatively constant.

The results reinforce the relevance of the Tier 1 capital ratio for making subordinated debt safer, while markets price the higher risk of banks with less stable sources of funding in their liability/capital structures. Market conditions and economic environment variables also play a key role in explaining the subordinated bond yield spreads over senior bonds. Moreover, the findings highlight that the effects of changes/implementations of the regulation should be investigated taking into account the specific characteristics of the institutions and the different reactions of each kind of bond. In this regard, the analysis suggests that, after the introduction of the new bail-in regulation, there is a convergence between the bond yields of the GSIBs and the non-GSIBs, which could point out to a reduction in the perception of the so called “too big to fail” public implicit guarantee. Nevertheless, this convergence is largely driven by a decline in the non-GSIBs' bond yields mainly from 2017Q2 onwards, and not by significant increases in the bond yields issued by GSIBs.

1 Introduction

The implementation of the new capital and, in particular, bail-in regulations have increased the role of bank subordinated debt as a loss absorption instrument, and have blurred some boundaries between the characteristics of funding and capital. The capital rules (in the European Union, the EU Directive 2013/36/EU and Regulation EU 575/2013) allow subordinated debt that complies with certain eligibility requirements¹, to be part of the Tier 2 capital. However, the role of bank subordinated debt as a loss absorption instrument is more patent after the publication of the European Union's Bank Recovery and Resolution Directive (EU Directive 2014/59, also known as BRRD), which establishes a regulatory framework for bail-in regimes and sets the ground rules for the minimum requirements of own funds and eligible liabilities (MREL). Specifically, if a bail-in action is required, Tier 2 capital and any other non-Tier 2 subordinated debt can be written-down or converted into capital instruments if necessary after first writing down Tier 1 capital. Regarding the MREL, the new framework calls for EU banks to build up sufficient buffers of bail-in-able debt to absorb losses and therefore recapitalise themselves with private funds in case of failure. Given that subordinated debt, under certain criteria, can be eligible for the compliance of the MREL, there has been an increase of the issuance of this kind of instruments. In this respect, the EBA's Quantitative Update of the MREL Report (2017) shows that G-SIIs² have been more actively issuing MREL eligible instruments (according to 2016 and early 2017 data), in line with their higher requirements. Likewise, the ECB's Financial Stability Report (Box 7), November 2018, documents that the GSIBs have changed their funding mix in favour of bail-in-able debt according to the new requirements, while other banks are on aggregate significantly less advanced in building up their (more costly) bail-in-able debt.

Therefore, the relevance of the BRRD for the market pricing of subordinated debt is twofold: it makes explicit the subordination hierarchy to absorb losses in case of bail-in, which could increase investors' perceptions of the riskiness of subordinated bonds; and raises the need for some entities to issue subordinated debt to comply with the MREL targets. The two effects could raise concerns about the capacity of the market to absorb the new issuance of subordinated debt without increases in the costs. Also in relation with the regulation, there have been several initiatives to enhance market discipline. The MiFID II requires institutions to inform clients

¹Regulation EU 575/2013 Art. 45 and 63. One of the most important requirements is that debt can be amortized or converted into capital in case of the failure of the entity.

²Global Systemically Important Institutions identified by the European Banking Authority (following the "BCBS methodology for GSIBs").

holding or contracting instruments with loss absorption capacity about the potential treatment of such investments in resolution or insolvency. Furthermore, some national authorities have strengthened the requirements to appropriately inform retail investors about the consequences of the implementation of the BRRD³.

Against this background, the aim of this document is to analyse if the subordinated bond yield spreads against senior unsecured bonds have increased after the introduction or the implementation of the new bail-in regulation, and link the bond yields developments with the characteristics of the issuing entities and the economic and financial environment. By comparing subordinated bond against senior bond yields the resulting indicator is a proxy for the additional cost of the more junior debt, which in turn can be included in the Tier 2 capital and the loss absorption capacity (subordinated debt)⁴, against other unsecured debt with characteristics more related to funding (senior debt). It is worth noticing that senior debt, as an unsecured kind of liability, is potentially exposed to the burden of a bail-in. Nevertheless, as documented by Dübel (2013a), Dübel (2013b) and Schäfer, Schnabel, and Weder di Mauro (2016) in the recent history of bail-in procedures there have been only two cases involving senior unsecured debt creditors: in Denmark (2011) and in Cyprus (2013). Indeed, under the insolvency law of some jurisdictions, senior debt ranked *pari passu* with other liabilities, such as deposits or structured notes. Moreover, the no creditor worse off safeguard of the BRRD (which implies that no shareholder or creditor is expected to receive a worse treatment than in insolvency) would pose a legal challenge to write off this kind of debt and not the other liabilities in the same priority tranche in the insolvency law. To address this issue, the amendment of the Article 108 of the BRRD through the Directive (UE) 2017/2399 harmonised the EU rules on bank creditors' hierarchy under insolvency, and required Member States to create a new class of non-preferred senior debt, which are eligible to compute for the loss absorbing capacity. Given the short time span of this new kind of bonds, their analysis as a separate kind of senior bonds is out of the scope of this study. However, they are included as senior bonds in the analysis after 2017Q2, but without any impact on the results.

Unlike other studies, this work emphasizes the difference in the reactions of bond yields

³This is in line with the Statement of the EBA and ESMA on the treatment of retail holdings of debt financial instruments subject to the Bank Recovery and Resolution Directive (May 2018) and the Commission's recommendations in the context of the November 2016 Banking Package, which consider to amend the MiFID II to include these information requirements.

⁴It should be noted that the determination as to whether or not an instrument counts towards the fulfilment of the subordination requirement depends on the composition of the liabilities base of the individual bank. The resolution authorities are establishing these requirements on an individual bank level.

depending on their seniority after the entry into force and the implementation of the new bail-in regulation. The empirical analysis focuses on 41 EU credit institutions, for the period 2014Q4-2018Q2, with debt issuance and balance sheet data at the consolidated level. Bond yields are retrieved from Markit Iboxx, a dataset which provides indices for subordinated bonds and senior bonds at the firm level following a set of comparability and quality checks in the raw market data. The firm-specific explanatory variables of the bond yield spreads are obtained mainly from the Orbis Bank Focus database, and reflect solvency, balance sheet structure, size, asset quality, profitability and business model. The analysis also considers indicators that capture the market conditions or the economic environment in which banks operate, namely overnight interest rates, the volatility of the Euro Stoxx banks index and economic growth prospects. Furthermore, when examining the impact of the entry into force and the implementation of the new bail-in regulation, the analysis considers other characteristics of the banks, such as their classification as Global Systemically Important Institutions (GSIBs), business model and country of origin. GSIBs are expected to show a higher impact on their funding costs after the introduction of the new BRRD rules, because they were the kind of institutions that might have benefited the most from the public guarantee expectations of bail-outs. In addition, the increased issuance of MREL eligible instruments by GSIBs in line with their higher requirements of loss absorbing capacity might have had an impact on their funding costs. Business specialization could be relevant when examining bond yields, given that banks active in trading, investment banking and sophisticated asset management are financed primarily through wholesale funding and might be more exposed to the risk perceived by investors. Finally, the split of the banks according to their country of origin is motivated because bond issued by banks headquartered in countries more affected by the sovereign debt crisis could be more sensible to changes in the risk perception.

The estimations using a fixed-effect model highlight the role of the Tier 1 capital ratio making subordinated debt safer and therefore less costly, whereas the ratio of subordinated debt over total capital funds shows a positive and significant correlation with the subordinated bond yield spreads over senior bonds. Market conditions and economic environment variables also play a key role in explaining subordinated bond yield spreads.

The analysis does not show evidence of a significant and generalized increase in the subordinated bond yields in the sample under review. The focus is on the entry into force of the bail-in rules under the BRRD on 1 January 2016, and the period after bail-in episodes of subordinated debt due to the resolution of a Spanish bank and the liquidation of two Italian banks, in June and

July 2017 respectively. Yet, the effects of changes/implementations of the regulation should be explored also taking into account the specific characteristics of the institutions and the different reactions of each kind of bond. The results show that after the introduction of the new bail-in regulation, there is a convergence between the bond yields of the GSIBs and the non-GSIBs, which could signal a reduction in the perception of the so called “too big to fail” public implicit guarantee. Nonetheless, this convergence is mostly driven by the reduction of the yields of bonds issued by banks not categorized as GSIBs, and not by significant increases in the GSIBs’ bond yields.

The remainder of this paper is structured as follows. Section 2 provides a brief overview of the related literature. Section 3 presents the dataset and some descriptive statistics. Section 4 discusses the models and the results including the explanatory variables described in Section 3 and some robustness checks. Section 5 concludes.

2 Related Literature

The empirical literature on banks’ unsecured debt yields determinants is quite scarce, and only in recent years researchers have started exploring this topic in the context of the bail-in regulation assessment. Crespi et al. (2019) finds that, since the entry into force of the BRRD, there was an increase in the average cost of issuance of bail-inable bonds compared to bonds not subject to the new regulation in the Italian primary market, after controlling for bond and bank characteristics. The paper also finds that banks characterized by lower ratings, profitability, capitalization, and higher liquidity faced higher cost of issuing bail-inable bonds under the new bail-in regime. Giuliana (2018) uses a difference-in-difference approach to show that the events signalling higher (lower) commitment towards the bail-in increased (reduced) the yield differential between unsecured and secured bonds, using a sample of listed bonds of European banks in the secondary market. This body of literature usually compares the yields of unsecured bonds - considered as bail-inable bonds- over the yields of secured bonds or government bonds, to estimate the change in the risk perception due to the new regulation. However, they do not account for the enormous differences between senior and subordinated (both unsecured) debt. Only in the robustness checks, Giuliana (2018) splits the sample of unsecured bonds by seniority, but does not find statistically significant differences between the reactions of the two bail-inable subcategories during the bail-in events considered. Nevertheless, it is relevant to check if the clarification of the

creditor hierarchy under the BRRD has altered the risk perception of subordinated debt against senior debt. In line with the work of Götz and Tröger (2016), it is worth analysing if investors in subordinated debt charge adequate risk premiums and thus exert meaningful market discipline on banks.

Chan-Lau and Oura (2016) examine the impact of different regulatory reforms on bank funding structures and costs using a Merton model approach ⁵. The authors show that the bail-in rules increase the cost difference between bail-inable and non-bail-inable bonds, and perform simulations for four banks. The results of the simulations illustrate that large equity buffers and low risk in the balance sheet structure kept the simulated subordinated debt yield of an U.S. retail bank at low, while for the other banks the simulation resulted in higher yields than the actual ones, which could reflect partially the effect of a potential “too big to fail” (TBTF) subsidy. The relevance of the bank funding structure is also highlighted by Götz and Tröger (2016), who show a negative correlation between bank equity and subordinated debt financing, indicating that more fragile banks finance themselves to a larger degree with subordinated debt. Hence, this negative correlation suggests that the subordinated debt of these banks is also more likely to be bailed-in as banks with relatively lower CET1 are indeed riskier. Less recent studies not directly related to the bail-in regulation, have measured the concept of market discipline as the sensitivity of subordinated bonds yields (or prices) to bank-specific risk measures. In particular, Covitz et al. (2004), Sironi (2003) and Jagtiani et al. (2002) emphasize the role of banks’ risk to determine their funding costs.

This work also speaks to the literature examining the TBTF public implicit guarantee, which estimates the funding cost advantage of large institutions due to the market expectations that public authorities rescue them in times of severe financial distress. In this regard, Ueda and Weder di Mauro (2013) estimate a funding cost advantage for SIFIs about 60 basis points as of the end-2007, before the crisis, and 80 basis points by the end-2009. Acharya, Anginer and Warburton (2016) also study the presence of a TBTF public implicit guarantee showing that the bond spreads of small and medium banks are more correlated with risk-specific measures than bonds issued by large banks. In this context, after the introduction of the new BRRD rules, systemically important institutions are expected to show a higher impact on their funding costs,

⁵Specifically, the authors extend the Merton’s framework, which prices debt and equity, to consider also preferred deposits (under depositor preference), and the differences between secured debt (with asset encumbrance), unsecured senior debt and subordinated debt (including CoCos). For more information about the Merton model, see notes in Section 4.

because they were the kind of institutions that might have benefited the most from the public guarantee expectations. Crespi et al. (2018) finds that large banks, on average, faced higher bond issuance costs than before the implementation of the new bail-in regulation. Giuliana (2018) also finds that the bail-in events have affected more intensely the bond yields of larger banks. Schäfer, Schnabel, and Weder di Mauro (2016) study the reactions of credit default swap (CDS) spreads and share prices of European banks after the announcement bail-in events, and find that in many cases, systemic banks showed larger reactions. Furthermore, Schäfer, Schnabel, and Weder di Mauro (2016) find higher reactions to events of banks located in countries with lower fiscal capacity, as it could be more difficult for these countries to conduct bank bail-outs.

This paper builds on the existing literature and makes the following contributions: unlike other studies, it uncovers the difference in the reactions of bond yields depending on their seniority after the entry into force and the implementation of the new bail-in framework; shows the relevance of controlling for bank-specific variables and indicators reflecting the economic and financial environment; and analyses the potential disappearance of the TBTF public implicit guarantee taking into account the characteristics of the bonds and the issuers.

3 Data

3.1 Data and sources

The empirical analysis focuses on 41 European Union credit institutions, for the period 2014Q4-2018Q2, with debt issuance and balance sheet data at the consolidated level. In line with the structural subordination⁶ allowed by the BRRD, the sample mainly comprises banking groups, and only few stand-alone banks that have been included after checking their HoldCo/OpCo structure. The sample excludes entities declared failing or likely to fail, and data have been comprehensively checked to consider possible structural changes in the institutions, such as mergers and acquisitions, with implications for their balance sheet and bonds. Total assets of the resulting sample account for the 59.1 per cent of the sum of credit institutions' total assets in their countries of origin.

The dependent variable is the spread between subordinated and senior unsecured bonds

⁶Debt issued by a holding company that is structurally subordinated to the operating company. Götz and Tröger (2016) and Crespi et al. (2018) highlight that a relatively high proportion of European banks' unsecured debt was issued by affiliates, which could add a layer of opacity regarding the risk of bail-in of a certain bond, as investors may not be aware of the organizational structure and hence misjudge the possibility of a bail-in. This issue is out of the scope of this paper, but could be relevant for future investigation.

yields, with maturity higher than one year, negotiated in the secondary market. The source of these data is Markit Iboxx, a dataset which provides indices of subordinated bonds and senior bonds at the firm level following a set of checks in the raw market data. The advantage of using the indexes built by Markit Iboxx is that they offer a broad coverage of the bond universe and uphold standards in terms of classifications and calculations. The yields of different bond types (coupon-payments bonds, plain vanilla bonds, funged bonds...) by issuer are aggregated by Markit depending on their seniority, and taking into account their features⁷. The daily data on yields have been transformed into quarterly averages, to be merged with the balance sheet data. Given that entities declared failing or likely to fail are not included in the sample, yields are not censored or winsorized, and there is no outlier correction.

Unlike the issuance costs (yields to maturity at issuance), the yield of bonds negotiated in the secondary market is a proxy variable of the funding cost linked to the rollover cost. Therefore, an increase in the yields in the secondary market will not contribute to higher funding costs until the bonds mature and the entity issue new bonds or the bonds are rolled over. The use of secondary market data is motivated by the limited availability of primary market data, especially for institutions that issue infrequently (Birchler and Facchinetti 2007).

The explanatory variables of the analysis can be split into two categories: bank-specific variables and indicators that capture the market conditions or the economic environment in which the banks operate. The firm-specific variables are obtained mainly from the Orbis Bank Focus database (managed by Bureau van Dijk), and reflect solvency, balance sheet structure, size, asset quality, profitability and business model. In particular, the solvency variable included in the baseline specification is the Tier 1 Capital ratio, and the analysis also considers the 5-year implied rating provided by the DRSK module of Bloomberg. The main variable on the liability structure is the ratio of total subordinated debt in the balance sheet over total capital funds. Other variables considered are the share of impaired loans over total loans, size (as the logarithm of total assets), liquid assets over deposit and ROA/ROE.

The analysis also takes into account the time to maturity of the bonds in the sample. To this end, the weighted average (by market value) of the remaining life of the bonds is estimated for both senior and subordinated bonds issued by each bank in the sample. The variable included in

⁷Some of the features taken into account when computing the yields and aggregating the bonds are the time to maturity, the coupon size or the interest accrued until the redemption date. Fan et al., (2003) and Santos (2014) point out that the information content of the bond yields and prices might differ with regard to their characteristics. Therefore it is crucial to select a database that takes into account the characteristics of the bonds and estimates their yields using standards.

the regressions is the difference between the (weighted average) remaining life of the subordinated bonds and the senior bonds of each bank.

The business model has been included as a dummy variable that differentiates between commercial banks, investment and mortgage banks. In the same vein, a dummy reflecting the classification as Global Systemically Important Financial Institution according to the Financial Stability Board ⁸, and a dummy differentiating banks headquartered in Italy or Spain have been considered in some analysis. The latter dummy variable is referred in the analysis as “dummy Peripheral”, and takes into account possible differential effects in the countries in the sample that were more affected by the European sovereign debt crisis.

The indicators that reflect market conditions or economic environment vary over time and/or across economic areas. The variables considered are risk-free rates, approximated by the overnight interest rate for the economic areas included in the analysis (namely EONIA, SONIA, Danmarks Nationalbank T/N, T/N STIBOR); the volatility of the Euro Stoxx banks index (own elaboration using Bloomberg data), to capture shocks in capital financing; and economic growth prospects, measured by the Consensus Forecast real GDP expectations one-year ahead. The analysis also considers dummy variables to check if there are changes in the spreads not captured by the explanatory variables after changes or implementations of the new bail-in framework. Specifically, the analysis using dummy variables after 2016 and after 2017 Q2 represents the entry into force of the bail-in regulation of the BRRD and episodes of implementation of the regulation (resolution of a Spanish institution and the liquidation of two Italian institutions) respectively. The significance of these dummy variables could indicate changes in the perception of the market about the loss given default of the subordinated debt compared to the senior debt, or reactions of the market to the issuance/rollover of loss absorption instruments.

The time span under review has been chosen in accordance with the availability of more extensive quarterly balance sheet data in the Orbis Bank Focus database. Furthermore, the sample starts after the most severe years of the global economic crisis, and covers a period with higher harmonization of the financial regulatory environment across European countries than previous years.

⁸In the sample, the number of institutions categorized as GSIBs are around nine, depending on the year. The list of GSIBs is published in November every year by the FSB.

3.2 Descriptive statistics

Table 1 summarizes the main data in the analysis in 2015 Q4 and 2017 Q4, together with the number of credit institutions and bonds by country. The two points in time under review correspond to the quarter before the entry into force of the new bail-in regulation (2015 Q4) and the most recent Q4 data available in the sample (2017 Q4).

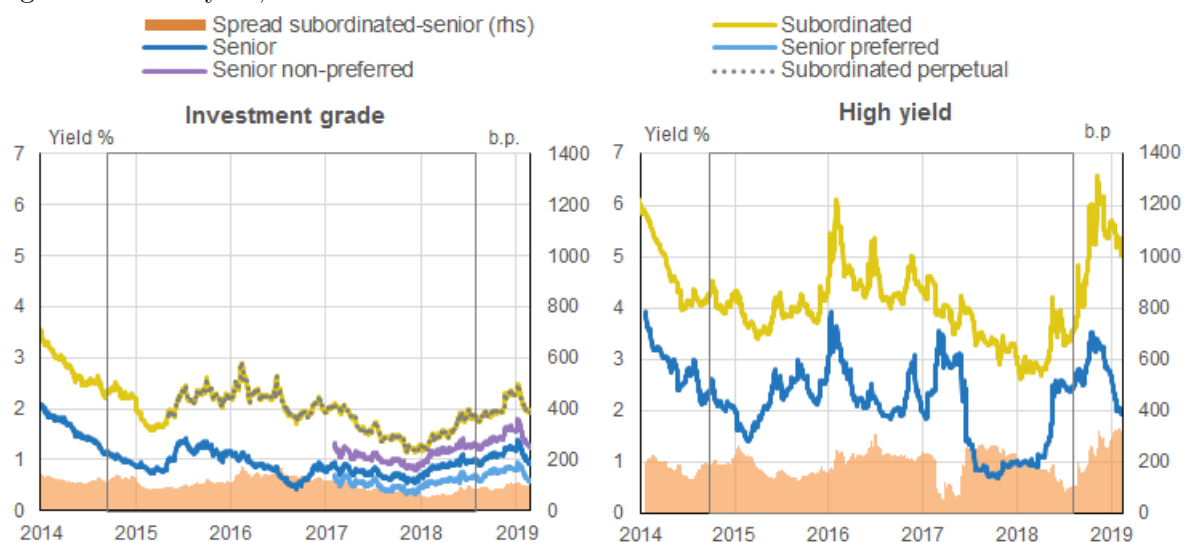
A simple inspection of the table suggests that spreads have decreased or remained broadly stable compared with 2015Q4. Tier 1 capital ratio increased in all countries under review, while there is not a clear pattern in the ratio of subordinated debt over total capital funds. This later ratio can decrease if total capital funds increase more than the subordinated debt in the balance sheet. The number of bonds considered has broadly increased, (from 232 in 2015 Q4 to 294 in 2017 Q4) and remains concentrated in France, United Kingdom and Netherlands.

Table 1. Summary of the main indicators, average over country.

country	N. banks	2017 Q4					2015 Q4				
		Spread subord.-senior unsecured debt	Tier 1 capital ratio	Subord. debt/Capital funds	N. bonds senior	N. bonds subord.	Spread subord.-senior unsecured debt	Tier 1 capital ratio	Subord. debt/Capital funds	N. bonds senior	N. bonds subord.
AT	2	110.0	13.7	23.2	3	9	482.0	11.8	30.5	4	6
BE	2	115.3	15.8	10.8	3	2	112.0	14.7	15.3	3	2
DE	3	129.6	15.5	24.8	13	9	224.0	14.7	25.3	6	5
DK	2	73.4	19.1	12.2	8	3	128.9	17.8	14.3	2	5
ES	5	130.2	13.3	18.7	8	11	191.0	12.1	13.4	6	5
FI	1	39.7	16.0	27.2	6	1	119.9	14.1	31.7	7	1
FR	5	90.8	14.4	25.0	57	22	157.5	12.7	21.9	44	17
GB	6	65.2	20.7	24.3	22	12	109.5	17.7	25.5	23	7
IE	1	132.1	18.0	5.5	2	1	261.3	13.8	16.0	2	1
IT	6	203.9	13.5	21.9	15	16	224.0	12.9	23.2	15	11
NL	4	41.7	21.6	24.6	28	12	132.5	18.2	25.9	29	11
SE	4	61.1	24.1	12.0	23	8	107.5	22.6	12.4	13	7

Notes: averages over country and period considered (2015 Q4 and 2017 Q4). Spreads are shown in basis points, while Tier 1 capital ratio and subordinated debt over total capital funds are percentages.

Figure 1: Yield spread between subordinated and senior unsecured bonds indices, with maturity higher than one year, EUR.

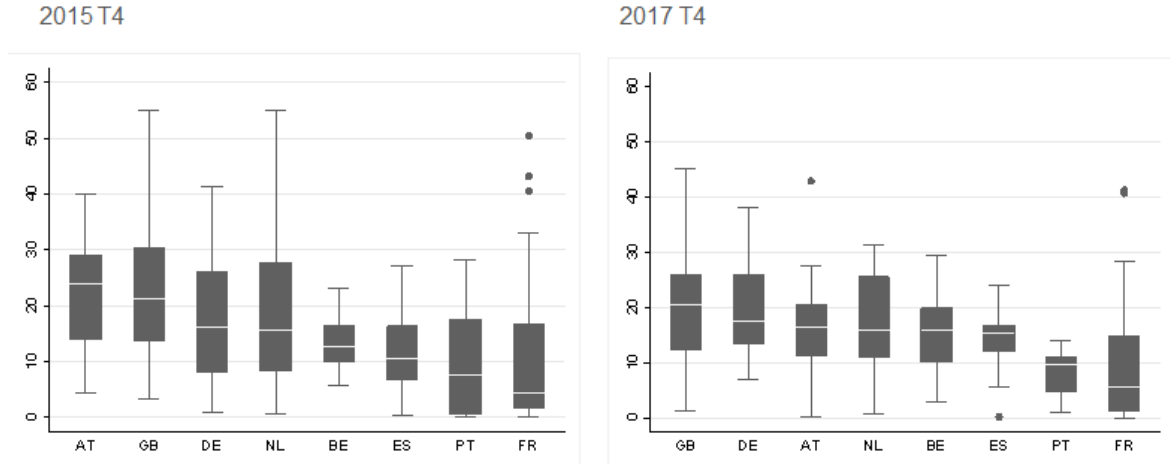


Source: Markit Iboxx. Notes: breakdown of preferred and non-preferred not available for high yield bonds. The timespan of the analysis is marked with bars.

The developments shown in the micro data are confirmed in the analysis of the macro data. Figure 1 depicts the time series of the overall indices of EUR denominated subordinated and senior bond yields, differentiating between investment grade and high yield bonds. Senior non-preferred bond yields are also displayed. Given the sort period of quotation of the new non-preferred senior bonds (introduced by the Directive (EU) 2017/2399), their analysis as a separate kind of senior bonds is out of the scope of this study. However, they are included as senior bonds in the analysis after 2017Q2, but without any impact on the results. The comparison of some other relevant variables with the figures in the ECB Consolidated Banking database can be found in the Appendix.

The high dispersion in the bank characteristics and the differences in the economic and financial environment in which banks operate, justify the use of micro data. In line with the evidence shown by Götz and Tröger (2016), the data depicted in Figure 2 display a considerable heterogeneity in European banks' reliance on subordinated debt financing across countries.

Figure 2: Figure 2: Ratio of subordinated debt over total capital funds.



Source: Orbis Bank Focus.

Note: available consolidated data in Orbis Bank Focus.

4 Empirical methodology and results

4.1 Baseline model

To assess the explanatory power of the different bank-specific characteristics and the market/financial environment indicators on the variation of the subordinated-senior bond yield spreads, the analysis is based on the following fixed-effects model:

$$Sub\ yield_{it} - Sen\ yield_{it} = \mu_i + \beta_1 T1Cap.ratio_{it-1} + \beta_2 Sub.debt/Cap.funds_{it-1} + \sum_{n=3}^N \beta_n X_{it-1} + \sum_{m=1}^M \beta_m X_{ct} + \sum_{p=1}^P \beta_p X_t + e_{it} \quad (1)$$

Following the convention in the empirical literature, the bank characteristics are lagged one quarter to avoid endogeneity issues. The variables that reflect the market sentiment or economic environment, X_{ct} , capture time variation and, in some cases, economic area variation. They have been included in the regressions lagged or not according to the economic rationale. In particular, changes in the overnight rates are assumed to have a lagged effect on bond markets, while shocks in capital financing captured by the Euro Stoxx banks index volatility might affect bond yields contemporaneously. Table 2 presents the results of the baseline model under different specifications following a parsimonious approach, to check the stability of the coefficients when adding different control variables.

Table 2. Explanatory factors of the yield spread of subordinated bond over senior bonds

Variables	Bank fixed effects			
	(1)	(2)	(3)	(4)
Tier 1 Capital Ratio $_{it-1}$	-0.149*** (0.044)	-0.141*** (0.046)	-0.152*** (0.046)	-0.088** (0.043)
Subordinated debt/Capital funds $_{it-1}$	0.045** (0.020)	0.033** (0.016)	0.032** (0.015)	0.034** (0.014)
Log (Total assets) $_{it-1}$		-0.624 (0.653)	-0.495 (0.682)	-0.541 (0.650)
Impaired loans / Gross loans $_{it-1}$		0.125* (0.073)	0.130* (0.075)	0.107 (0.069)
Time to maturity subordinated - senior $_{it}$	0.047 (0.038)	0.037 (0.036)	0.044 (0.036)	0.031 (0.029)
Overnight interest rate $_{c,t-1}$	0.991*** (0.363)	0.514* (0.268)	1.370*** (0.434)	0.644* (0.321)
GDP growth expectations 1y ahead $_{ct}$	-0.520*** (0.178)	-0.449*** (0.119)	-0.400*** (0.128)	-0.134 (0.100)
Volatility Euro Stoxx Banks index $_t$	0.006*** (0.001)	0.006*** (0.001)	0.005*** (0.001)	0.003*** (0.001)
Dummy post - 2016 Q1			0.390*** (0.126)	
Dummy 2016 Q1 - 2017 Q1				0.409*** (0.140)
Dummy post - 2017 Q2				-0.224* (0.131)
Constant	3.709*** (0.634)	19.610 (17.610)	16.110 (18.400)	16.190 (17.550)
Observations	446	439	439	439
R-squared	0.402	0.462	0.477	0.563
Number of id	41	41	41	41

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

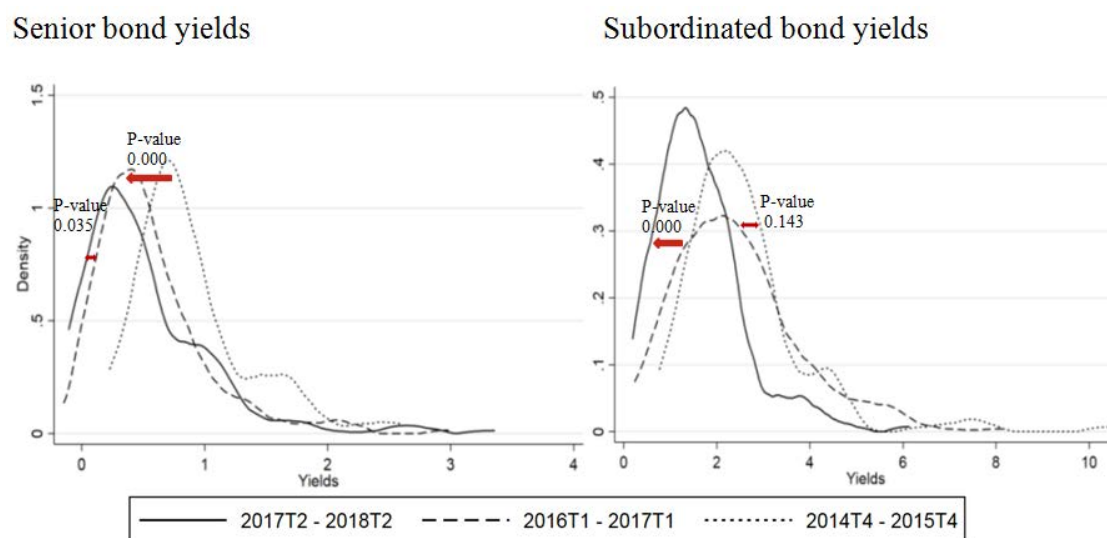
When analysing the results, the focus is on the Tier 1 capital ratio and the ratio of subordinated debt over total capital funds, given that their coefficients are statistically significant and stable even when adding other control variables (i.e. showing not much collinearity between the balance sheet structure and size) [Specification 1 and 2]. As expected, the Tier 1 capital ratio correlates negatively with the subordinated-senior debt spreads, as it comprises core capital and hybrid instruments, which rank lower in the order of seniority, making subordinated debt safer and therefore cheaper. A more novel finding is that the ratio of subordinated debt over total capital funds is positively correlated with the subordinated-senior bond spreads, indicating that markets price the higher risk of banks with less stable sources of funding in their liability/capital

structures. As shown in Table A1 of the Appendix, this correlation holds in other specifications and there are no (statistically significant) differential effects of this indicator when taking into account the business specialization, the country of origin and the classification as GSIBs of the banks. The positive coefficient of the share of impaired loans over total loans indicates that creditors value asset quality, in particular subordinated bond holders, as the higher credit risk exposure could weight on the future performance of the bank. The size variable is not statistically significant, maybe due to the fact that the economies of scale in placing issuance affect both subordinated and senior bonds, hence not affecting the spreads between them. However, it is included as a bank-specific control given that is useful to capture idiosyncratic characteristics of bigger banks, such as corporate governance or diversification experience, which can have an impact on debt yields. Issues related to the potential existence of a "too big to fail" implicit guarantee (Demirgüç-Kunt and Huizinga 1999) are investigated thereafter in this document separating the analysis for senior and subordinated bonds (Section 4.2). The difference between the remaining life of the two types of bonds by bank is also included in the regressions even though it is not statistically significant. This variable is considered as a control given that, all else being equal, bonds with longer time to maturity usually pay higher interest rates than bonds with shorter remaining life. Spreads between subordinated and senior bonds might be partly explained by their different time to maturity or by the uneven shortening or extending of the maturity of the new issued bonds over time, i.e. longer for subordinated and shorter for senior. Other variables considered but not included in the regressions due to their low explanatory power are measures of Profitability (ROE and ROA) and the ratio of Liquid Assets over Deposits. Results are available upon request.

Table 2 also shows the key role of market conditions/economic environment and the differential effects after the introduction or the implementation of the new bail-in regulation. Specifically, after the entry into force of the bail-in rules in the BRRD on 1 January 2016, there was an increase in the spread of the bank subordinated debt yields over the senior bond yields of almost 40 basis points that is not attributed to other variables included in the model [Specification 3]. The last specification of the table [Specification 4] reveals that the rise in the spread took place in 2016, whereas there was a reduction in the differentials after 2017Q2. However, contrary to the market discipline hypothesis, these developments were not attributable to significant and generalized increases in the subordinated bond yields in 2016, but driven by decreases in the senior bond yields. Figure 3 illustrates the Kernel densities and the homogeneity of distribution

tests for the subordinated and senior bond yields in the sample in the periods under review.

Figure 3. Kernel densities and homogeneity of distribution tests (H0: homogeneous distributions).



The analysis of the different kind of bonds separately shows that there is no evidence of a higher risk perception in the sample under review. The entry into force of the bail-in rules may have reduced the Probability of Default for senior debt in 2016, by providing with early intervention tools and a framework that allows senior bondholders to be relatively well protected against losses in case of failure. The distribution of the subordinated bond yields does not show a statistically significant change in 2016 probably because the effect of the BRRD was probably already anticipated by the European Commission's 2013 Communication on State Aid to banks (also known as the "Banking Communication"). This Communication called for the burden-sharing by investors and subordinated creditors in case of capital shortfalls already in August 2013. From 2017Q2 onwards, despite bail-in episodes of subordinated debt due to the resolution of a Spanish bank and the liquidation of two Italian banks, in June and July 2017 respectively, there is no evidence of a higher risk perception translated into increases in the bond yields in the sample.

Importantly, other factors not necessarily attributable to the bail-in regime, such as the effects of a long period of yields being low by historical standards or the Basel III implementation, may have had different effects on bond yields. In this regard, 2016 coincides with the launch of the ECB monetary policy package that comprises, among other measures, the beginning of the

Corporate Sector Purchase Programme (CSPP)⁹, the lowering of the key monetary policy rates and the introduction of a new series of targeted longer-term refinancing operations (TLTRO-II). As reported by De Santis et al. (2018) and Zaghini (2017), spillovers from the CSPP and other monetary policy measures might have narrowed the spreads not only for CSPP-eligible bonds, but also for non-eligible bonds for purchase under the CSPP (such as bonds issued by banks) owing to the portfolio rebalancing channel¹⁰. Concerning the Basel III implementation, the build-up of capital and de-risking may have led to a general decline in both yields while keeping the spread relatively constant. On the other hand, the year 2016 was characterized by lack of clarity on the stacking order of capital requirements and the increased spread documented in Table 2 may partly be related to this issue (in particular for GSIBs).

4.2 Analysis of the impact of changes/implementation of the regulation taking into account the specific characteristics of the institutions and the kind of bonds

To go deeper in the analysis, the model is augmented with interactions of factor and dummy variables to check if there are differential effects of the change or the implementation of the regulation according to the classification as GSIBs, business model and country of origin of the institutions.

$$Sub\ yld_{it} - Sen\ yld_{it} = \mu_i + \sum_1^N \beta_n X_{it} + \sum_1^M \beta_m X_{ct} + \sum_1^P \beta_p X_t + \sum_1^3 f_{regulation_t} d_{characteristics(i)_t} + e_{it} \quad (2)$$

In particular, GSIBs are expected to show a higher impact on their funding costs after the introduction of the new BRRD rules, because they were the kind of institutions that might have benefited the most from the public guarantee expectations of bail-outs. Furthermore, GSIBs have higher requirements of loss absorption capacity, and their increased issuance of MREL eligible instruments might have had an impact on their funding costs. Business specialization could be also relevant when examining bond yields, given that banks active in trading, investment banking and sophisticated asset management are financed primarily through wholesale funding

⁹The CSPP is the ECB purchase programme of investment-grade euro-denominated bonds issued by non-bank corporations that are established in the euro area. It was announced on 10 March 2016 and purchases started on 8 June 2016.

¹⁰As yields and spreads of bonds purchased by the Eurosystem decline, and eligible bonds are scarcer in the market, investors have the incentive to shift their portfolios towards other assets with similar risk characteristics that are expected to provide better returns.

and might be more exposed to the risk perceived by investors. Finally, the split of the banks according to their country of origin is motivated because bond issued by banks headquartered in countries more affected by the sovereign debt crisis could be more sensible to changes in the risk perception. Table 3 shows the interaction terms between these bank characteristics and the dummy variables that reflect changes or implementation of the bail-in regulation.

Table 3. Differential effect of changes/implementation of the regulation according to the classification as GSIBs, business model and country of origin

Variables	Bank fixed effects		
	(5)	(6)	(7)
Tier 1 Capital Ratio $_{it-1}$	-0.082** (0.036)	-0.087* (0.046)	-0.077* (0.040)
Subordinated debt/Capital funds $_{it-1}$	0.034** (0.013)	0.034** (0.015)	0.033** (0.014)
Log (Total assets) $_{it-1}$		-0.538 (0.656)	-0.581 (0.678)
Impaired loans / Gross loans $_{it-1}$	0.090 (0.071)	0.107 (0.069)	0.111 (0.075)
Time to maturity subordinated - senior $_{it}$	0.021 (0.033)	0.031 (0.027)	0.031 (0.031)
Overnight interest rate $_{c,t-1}$	0.737** (0.291)	0.644* (0.332)	0.565 (0.337)
GDP growth expectations 1y ahead $_{ct}$	-0.162 (0.139)	-0.135 (0.092)	-0.136 (0.093)
Volatility Euro Stoxx Banks index $_t$	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)
Dummy 2016 T1 - 2017 T1	0.364** (0.140)	0.347** (0.146)	0.268* (0.145)
Interaction with Dummy GSIBs	0.127 (0.178)		
Interaction with Dummy Specialization		0.057 (0.193)	
Interaction with Dummy Peripheral countries			0.405* (0.212)
Dummy post - 2017 T2	-0.322** (0.151)	-0.219 (0.192)	-0.357** (0.164)
Interaction with Dummy GSIBs	0.409* (0.231)		
Interaction with Dummy Specialization		-0.006 (0.255)	
Interaction with Dummy Peripheral countries			0.420 (0.297)
Constant	1.913*** (0.633)	16.120 (17.720)	17.090 (18.220)
Observations	446	439	439
R-squared	0.560	0.564	0.571
Number of id	41	41	41

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10

The results reveal that the increase in spreads between subordinated and senior bond yields was more relevant in 2016 for Italy and Spain, represented by the peripheral countries dummy. This outcome is largely driven by Italy, where political uncertainty and debt sustainability concerns have repeatedly contributed to an increase in bond spreads. Results of the time interactions with individual dummies for these countries are available upon request. In addition, Table 3 illustrates that after 2017Q2 there is a significant differential effect for institutions classified as GSIBs, potentially indicating a reduction in the perception on the "too big to fail" implicit guarantee, which is investigated in more detail thereafter. Finally, the results also show that there are no differential effects when taking into account the business specialization of the institutions.

To explore if there is a reduction in the perception in the "too big to fail" public implicit guarantee, Table 4 displays the differential effect of changes or implementation of the regulation according to the classification as GSIBs for senior [Specification 7a] and subordinated [Specification 7b] bond yields separately.

Table 4. Differential effect of changes/implementation of the regulation according to the classification as GSIBs. Senior and subordinated breakdown

Variables	Bank fixed effects	
	Differential effect GSIBs?	
	(7a) senior	(7b) subordinated
Tier 1 Capital Ratio $_{it-1}$	-0.005 (0.010)	-0.110 ^{***} (0.037)
Subordinated debt/Capital funds $_{it-1}$	0.002 (0.005)	0.032 ^{**} (0.014)
Impaired loans / Gross loans $_{it-1}$	0.001 (0.020)	0.081 (0.082)
Time to maturity $_{it}$	0.127 ^{***} (0.043)	0.111 ^{***} (0.038)
Overnight interest rate $_{c,t-1}$	0.440 ^{**} (0.194)	0.986 ^{**} (0.405)
GDP growth expectations 1y ahead $_{ct}$	0.138 ^{***} (0.051)	0.006 (0.147)
Volatility Euro Stoxx Banks index $_t$	0.002 ^{***} (0.000)	0.004 ^{***} (0.001)
Dummy 2016 Q1 - 2017 Q1	-0.186 ^{***} (0.049)	0.306 (0.167)
Interaction with Dummy GSIBs	0.130 ^{**} (0.059)	0.115 (0.195)
Dummy post - 2017 Q2	-0.243 ^{***} (0.066)	-0.457 ^{**} (0.174)
Interaction with Dummy GSIBs	0.036 (0.072)	0.346 [*] (0.174)
Constant	0.507 (0.280)	2.329 ^{***} (0.683)
Observations	461	472
R-squared	0.401	0.571
Number of id	41	41

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.10

When analysing senior bonds, the results show a reduction of the yields (not explained by other variables in the model) for bonds issued by non-GSIBs in 2016 and more notably from 2017Q2 onwards. Conversely, the GSIBs' senior bond yields remained broadly stable in 2016 and decreased less than the non-GSIBs ones after 2017Q2¹¹. In the same vein, the table displays

¹¹Given that the interactions and dummy variables are displayed in the tables as additional effects, the total coefficients for GSIBs should be computed as the coefficient of the time dummy (which corresponds to the coefficient for the rest of the banks) plus the interaction with the GSIBs dummy.

an even higher decline in the non-GSIBs' subordinated bond yields after 2017Q2 that was not so patent for GSIBs. Therefore, there is a convergence between the bond yields of the GSIBs and the non-GSIBs, which could point out to a reduction in the perception of the so called “too big to fail” public implicit guarantee. Nonetheless, this development is mostly driven by the reduction of the yields of bonds issued by banks not categorized as GSIBs, and not by increases in the GSIBs' bond yields.

Table A2 and Table A3 in the Appendix show the same analysis for senior and subordinated bonds separately taking into account the business specialization and the country of origin of the institutions, but the results do not show statistically significant differential effects.

4.3 Other specifications and robustness checks

Table 5 shows two other specifications estimated as robustness checks. In the first one [Specification 8], the solvency and asset quality indicators have been replaced by the 5-year implied rating of each bank provided by the DRSK module of Bloomberg¹². This indicator is a proxy for solvency, and is estimated by Bloomberg using the share of impaired loans as input, together with the share price and volatility, market capitalisation, debt structure, loan-loss reserves and net income. Although the sample is reduced given the availability of such data, results are robust and the coefficients show the same sign as in Table 2.

Moving to the second robustness check [Specification 9], it substitutes the market sentiment and economic environment indicators, which vary over time and/or across economic areas, by time effects (yielding a 2-way fixed effects model), to check if there is much time variation that the baseline model in Table 2 still does not capture. However, the R-square with time effects is not significantly higher, and in any case, the main findings hold.

¹²The DRSK module of Bloomberg is based on a Merton-type model to estimate implied probabilities of default and ratings for listed banks. The Merton model approach assumes that a firm defaults when the value of its assets becomes lower than the value of its liabilities. As the value of assets is unobservable, the model uses the market capitalisation, and considers that the equity of the firm can be valued as a call option on the total assets of the firm, where the strike price is equal to its liabilities. Merton models are often used to predict default probabilities, and the results can be used to estimate an implied rating. Similar estimates using this methodology can be found in Moody's CreditEdge and Kamakura.

Table 5. Explanatory factors of the yield spread of subordinated bond over senior bonds.
Alternative specifications

	Bank fixed effects (8)	Time and bank fixed effects (9)
Tier 1 Capital Ratio $_{it-1}$		-0.079* (0.045)
Implied rating drsk $_{it}$	0.007*** (0.001)	
Subordinated debt/Capital funds $_{it-1}$	0.061** (0.025)	0.036** (0.015)
Log (Total assets) $_{it-1}$	-0.583 (0.776)	-1.213 (0.895)
Impaired loans / Gross loans $_{it-1}$		0.099 (0.063)
Time to maturity subordinated - senior $_{it}$	0.061 (0.045)	0.030 (0.033)
Overnight interest rate $_{c\ t-1}$	1.432*** (0.510)	
GDP growth expectations 1y ahead $_{ct}$	-0.072 (0.160)	
Volatility Euro Stoxx Banks index $_t$	0.003** (0.001)	
Dummy 2016 Q1 - 2017 Q1	0.260 (0.172)	
Dummy post - 2017 Q2	-0.124 (0.177)	
Constant	15.450 (20.600)	33.460 (23.980)
Observations	306	440
R-squared	0.528	0.601
Number of id	29	41

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.10

5 Conclusion

This paper studies the impact of the introduction and implementation of the new bail-in regulations on the subordinated bond yield spreads against senior unsecured bonds, and underscores the relevance of the characteristics of the issuing entities and the economic and financial environment to explain bond yield developments. In particular, the results show that the Tier 1 capital ratio makes subordinated debt safer and therefore less costly. The ratio of subordi-

nated debt over total capital funds (in the banks' balance sheet) is positively correlated with the subordinated-senior bond spreads, indicating that markets price the higher risk of banks with less stable sources of funding in their liability/capital structures. As expected, market conditions and economic environment variables also play a key role in explaining the bond spreads.

The analysis does not show evidence of a significant and generalized increase in the spreads as a result of a higher risk perception in the sample under review. The new BRRD regime might have reduced the perception of risk of senior bondholders by providing with early intervention tools and a framework that protects senior bonds relatively well against losses in case of failure. Moreover, the effect of the BRRD on subordinated debt was probably already anticipated by the 2013 Banking Communication, which called for burden-sharing by investors and subordinated creditors in case of capital shortfalls. Other factors not necessarily attributable to the bail-in regime, such as the effects of the expansionary monetary policy measures or the Basel III implementation –enforcing the build-up of capital and de-risking processes- may have led to a general decline in both yields while keeping the spreads relatively constant. On the other hand, 2016 was characterized by lack of clarity on the stacking order of capital requirements, which could have contributed to the increase in the subordinated bond yield spreads against senior bonds during that year.

The results also highlight that the specific characteristics of the institutions and the different reactions of each kind of bond should be taken into account when analysing the changes or the implementation of the regulation. In this regard, the regressions show that after the introduction of the new bail-in regulation, there is a convergence between the bond yields of the GSIBs and the non-GSIBs, which could point out to a reduction in the perception of the so called “too big to fail” public implicit guarantee. Nonetheless, this convergence is largely driven by a decline in the non-GSIBs' bond yields mainly from 2017Q2 onwards, and not by significant increases in the yields of bonds issued by GSIBs.

Unlike other studies, this work emphasizes the difference in the reactions of bond yields depending on their seniority after the entry into force and the implementation of the new bail-in regulation. This paper contributes to fill this analytical gap, but additional work on the implications of the new bail-in regulation is required. Funding costs and capital, among other factors, determine the financial strength of the banks, and they are interconnected. Bond yields provide market information that should be considered when facing the withdrawal of monetary stimuli or possible changes in the economic and financial environment.

References

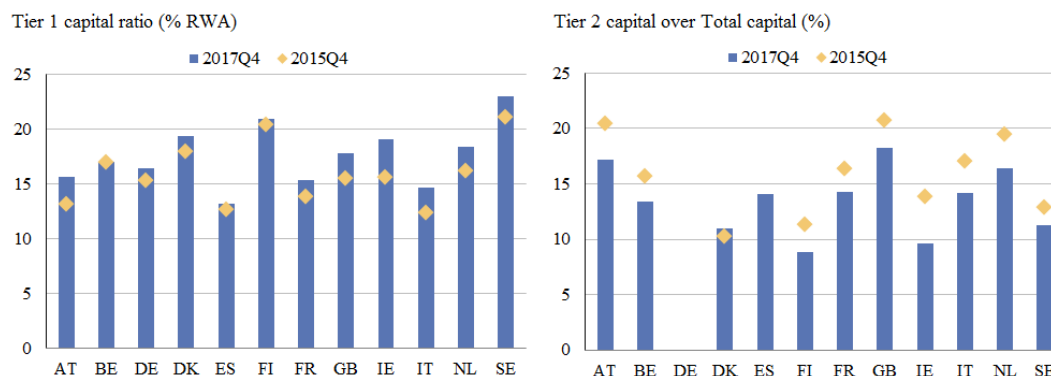
- [1] ACHARYA, V.V., ANGINER, D. AND WARBURTON, A.J. 2016. *The end of market discipline? Investor expectations of implicit government guarantees.*
- [2] BERGES, A., PELAYO, A. AND ROJAS, F. 2018. *La banca española ante el MREL. Emisiones para su cumplimiento.* Funcas, Cuadernos de Información Económica, March/April.
- [3] BIRCHLER, U.W. AND FACCHINETTI, M., 2007. *Can bank supervisors rely on market data? A critical assessment from a Swiss perspective.* Swiss Journal of Economics and Statistics, 143(2), pp.95-132.
- [4] CHAN-LAU, J.A. AND OURA, H., 2016. *Bail-In Power, Depositor Preference, and Asset Encumbrance: The End of Cheap Senior Unsecured Debt? A Structural Pricing Perspective.* A Structural Pricing Perspective.
- [5] COVITZ, D.M., HANCOCK, D. AND KWAST, M.L., 2004. *A reconsideration of the risk sensitivity of US banking organization subordinated debt spreads: A sample selection approach.*
- [6] CRESPI, F., GIACOMINI, E. AND MASCIA, D.V., 2018. *Bail in rules and the pricing of Italian bank bonds.* European Financial Management.
- [7] DE SANTIS R., GEIS A., JUSKAITE A. AND VAZ CRUZ L., 2018. *The impact of the corporate sector purchase programme on corporate bond markets and the financing of euro area non-financial corporations.* ECB Economic Bulletin, 2018/3.
- [8] DEMIRGÜÇ-KUNT, A. AND HUIZINGA, H., 1999. *Determinants of commercial bank interest margins and profitability: some international evidence.* The World Bank Economic Review, 13(2), pp.379-408.
- [9] DÜBEL, A., 2013A. *The capital structure of banks and practice of bank restructuring* (No. 2013/04). CFS Working Paper.
- [10] DÜBEL, H.J., DANIELS, M. AND BEJAN, I., 2013. *Creditor Participation in Banking Crisis in the Eurozone—A Corner Turned?.* Study commissioned by Bundestagsfraktion Bündnis, 90.
- [11] EBA 2017. *Quantitative Update of the MREL Report.* December.

- [12] ECB 2016. *The corporate bond market and the ECB's corporate sector purchase programme*. Economic Bulletin, Issue 5.
- [13] ECB 2017. *MREL: financial stability implications*. Macprudential Bulletin, December.
- [14] ECB 2018. *Bond funding of euro area banks: progress in the issuance of loss-absorbing instruments* Financial Stability Report (Box 7), November 2018.
- [15] FAN, R., JOSEPH G. HAUBRICH, P. R. AND THOMSON J. B. 2003. *Getting the most out of a mandatory subordinated debt requirement*. Journal of Financial Services Research 24 (2/3): 149-179.
- [16] GIULIANA, R., 2017. *Impact of Bail-in on Banks' Bond Yields and Market Discipline*.
- [17] GÖTZ, M.R. AND TRÖGER, T.H., 2016 *Should the marketing of subordinated debt be restricted/different in one way or the other? What to do in the case of mis-selling?* (No. 35). White Paper Series.
- [18] HILSCHER, J. AND RAVIV, A., 2014. *Bank stability and market discipline: The effect of contingent capital on risk taking and default probability*. Journal of Corporate Finance, 29, pp.542-560.
- [19] HUERTAS, T.F. 2014. *A Resolvable Bank*. LSE Financial Markets Group Special Paper No 230, London.
- [20] HUERTAS, T.F. 2016. *European Bank Resolution: Making it Work!*. Interim Report of the CEPS Task Force on Implementing Financial Sector Regulation, Brussels.
- [21] IANNOTTA, G., 2011. *Market discipline in the banking industry: evidence from spread dispersion*. The European Journal of Finance, 17(2), pp.111-131.
- [22] FUENTES, I., CASADO, C., 2017. *Contingent Convertible Bonds and Subordinated Debt of Euro Area Credit Institutions*. Banco de Espana Article, 31, p.17.
- [23] IMF 2018. *Bank Resolution and Crisis Management*. Financial Sector Assessment Program, July.
- [24] JAGTIANI, J., KAUFMAN, G. AND LEMIEUX, C., 1999. *Do markets discipline banks and bank holding companies? Evidence from debt pricing*. Emerging Issues, June.

- [25] JAGTIANI, J., KAUFMAN, G. AND LEMIEUX, C., 2002. *The effect of credit risk on bank and bank holding company bond yields: evidence from the Post-FDICIA period*. Journal of Financial Research, 25(4), pp.559-575.
- [26] LE LESLE, V. 2012. *Bank Debt in Europe: Are Funding Models Broken?*. IMF Working Paper WP/12/299.
- [27] PHILIPPON, T. AND SALORD, A., 2017. *Bail-ins and bank resolution in Europe*. Geneva Reports on the World Economy Special Report, 4.
- [28] SANTOS, J. 2014. *Evidence from the bond market on banks' 'too-big-to-fail' subsidy*. FRBNY Economic Policy Review, 20, 29–39.
- [29] SCHÄFER, A., SCHNABEL, I. AND WEDER, B., 2016. *Bail-in expectations for European banks: Actions speak louder than words*.
- [28] SIRONI, A., 2003. *Testing for market discipline in the European banking industry: evidence from subordinated debt issues*. Journal of Money, Credit and Banking, pp.443-472.
- [30] TRÖGER, T.H., 2017. *Why MREL won't help much: minimum requirements for bail-in capital as an insufficient remedy for defunct private sector involvement under the European bank resolution framework*. Journal of Banking Regulation, pp.1-18.
- [31] UEDA, K. AND DI MAURO, B.W., 2013. *Quantifying structural subsidy values for systemically important financial institutions*. Journal of Banking Finance, 37(10), pp.3830-3842.
- [32] ZAGHINI, A., 2014. *Bank bonds: size, systemic relevance and the sovereign*. International Finance, 17(2), pp.161-184.
- [33] ZAGHINI, A., 2019. *The CSPP at work: yield heterogeneity and the portfolio rebalancing channel*. Journal of Corporate Finance, 56, pp.282-297.

Appendix

Figure A1. Comparison with the ECB Consolidated Banking Database.



Source: CBD2.

Note: the ratio of Tier 2 capital over total capital is not directly comparable with the ratio of subordinated debt over total capital, given that not all subordinated debt is eligible as Tier 2 capital.

Table A1: differential effect of the ratio of subordinated debt over total capital funds depending on the classification as GSIBs, business model and country of origin.

Variables	Bank fixed effects		
	(6)	(7)	(8)
Tier 1 Capital Ratio $_{it-1}$	-0.141*** (0.043)	-0.117*** (0.035)	-0.124*** (0.037)
Subordinated debt/Capital funds $_{it-1}$	0.036** (0.017)	0.012 (0.013)	0.022* (0.012)
Interaction with Dummy Significant institution	-0.013 (0.018)	0.017 (0.023)	
Interaction with Dummy Specialization			-0.037 (0.030)
Interaction with Dummy Peripheral countries			
Log (Total assets) $_{it-1}$		-0.205 (0.455)	-0.144 (0.433)
Impaired loan / Gross loans $_{it-1}$	0.122* (0.072)	0.186*** (0.070)	0.186** (0.070)
Time to maturity subordinated - senior $_{it}$	0.035 (0.035)	0.043 (0.034)	0.043 (0.034)
Overnight interest rate $_{t-1}$	0.567** (0.261)	0.509* (0.300)	0.436 (0.302)
GDP growth expectations 1y ahead $_{ct}$	-0.483*** (0.150)	-0.501*** (0.142)	-0.488*** (0.136)
Volatility bank stock index $_{it}$	0.006*** (0.001)	0.006*** (0.001)	0.006*** (0.001)
Constant	3.291*** (0.820)	8.266 (12.01)	6.835 (11.61)
Observations	446	440	440
R-squared	0.450	0.485	0.493
Number of id	41	41	41

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.10

Table A2: differential effect of changes/implementation of the regulation according to the business model. Senior and subordinated bond breakdown

Variables	Bank fixed effects	
	Differential effect Specialization?	
	(8a) senior	(8b) subordinated
Tier 1 Capital Ratio $_{it-1}$	-0.007 (0.011)	-0.121** (0.046)
Subordinated debt/Capital funds $_{it-1}$	0.004 (0.005)	0.037* (0.019)
Log (Total assets) $_{it-1}$	-0.316** (0.143)	-0.914 (0.691)
Impaired loans / Gross loans $_{it-1}$	0.008 (0.019)	0.091 (0.073)
Time to maturity $_{it}$	0.130*** (0.043)	0.138*** (0.038)
Overnight interest rate $_{c,t-1}$	0.301* (0.174)	0.786* (0.461)
GDP growth expectations 1y ahead $_{ct}$	0.162*** (0.056)	0.095 (0.103)
Volatility Euro Stoxx Banks index $_t$	0.001*** (0.000)	0.004*** (0.001)
Dummy 2016 Q1 - 2017 Q1	-0.186* (0.095)	0.336 (0.206)
Interaction with Dummy Specialization	0.001 (0.101)	-0.033 (0.223)
Dummy post - 2017 Q2	-0.257** (0.108)	-0.299 (0.230)
Interaction with Dummy Specialization	0.006 (0.070)	-0.092 (0.142)
Constant	8.350** (3.847)	26.290 (18.500)
Observations	453	463
R-squared	0.422	0.586
Number of id	41	41

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.10

Table A3: differential effect of changes/implementation of the regulation according to the country of origin. Senior and subordinated bond breakdown.

Variables	Bank fixed effects	
	Differential effect Peripheral countries (ES and IT)?	
	(9a) senior	(9b) subordinated
Tier 1 Capital Ratio $_{it-1}$	-0.011 (0.010)	-0.112** (0.042)
Subordinated debt/Capital funds $_{it-1}$	0.004 (0.005)	0.034** (0.016)
Log (Total assets) $_{it-1}$	-0.293* (0.155)	-0.960 (0.767)
Impaired loans / Gross loans $_{it-1}$	0.007 (0.019)	0.100 (0.081)
Time to maturity $_{it}$	0.129*** (0.042)	0.144*** (0.039)
Overnight interest rate $_{c,t-1}$	0.322* (0.179)	0.733 (0.507)
GDP growth expectations 1y ahead $_{ct}$	0.160*** (0.049)	0.069 (0.097)
Volatility Euro Stoxx Banks index $_t$	0.001*** (0.000)	0.004*** (0.001)
Dummy 2016 Q1 - 2017 Q1	-0.165*** (0.058)	0.196 (0.208)
Interaction with Dummy Peripheral countries	-0.052 (0.080)	0.412 (0.282)
Dummy post - 2017 Q2	-0.210*** (0.071)	-0.479** (0.219)
Interaction with Dummy Peripheral countries	-0.072 (0.106)	-0.118 (0.319)
Constant	7.803* (4.123)	27.400 (20.410)
Observations	453	463
R-squared	0.427	0.590
Number of id	41	41

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.10

Acknowledgements

The views and opinions expressed in this paper are those of the author and do not necessarily agree with the official policy or position of the ECB.

Irene Pablos Nuevo

European Central Bank, Frankfurt am Main, Germany; email: irene.pablos_nuevo@ecb.europa.eu

© European Central Bank, 2019

Postal address 60640 Frankfurt am Main, Germany

Telephone +49 69 1344 0

Website www.ecb.europa.eu

All rights reserved. Any reproduction, publication and reprint in the form of a different publication, whether printed or produced electronically, in whole or in part, is permitted only with the explicit written authorisation of the ECB or the authors.

This paper can be downloaded without charge from www.ecb.europa.eu, from the [Social Science Research Network electronic library](#) or from [RePEc: Research Papers in Economics](#). Information on all of the papers published in the ECB Working Paper Series can be found on the [ECB's website](#).

PDF

ISBN 978-92-899-3886-0

ISSN 1725-2806

doi:10.2866/374056

QB-AR-19-098-EN-N
