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Has bail-in increased market discipline? An empirical investigation of European banks’ credit spreads

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Ryan Lindstrom[1] and Matthew Osborne[2]

Abstract

Following the banking sector stress events of 2008–09 and 2011–12, a new framework for resolving failing banks has been implemented in the European Union which aims to facilitate authorities imposing losses on private creditors. The new framework implements global standards requiring banks to maintain a minimum quantum of loss-absorbing (or 'bail-in') bonds. Using data on the credit spreads on large European banks' bonds between 2010 and 2019, we provide evidence that the risk sensitivity of banks' credit spreads has increased since the reforms, and that the level and risk sensitivity of spreads on senior bail-in bonds are higher than those of comparable non-bail-in bonds. These findings support the hypothesis that the reforms have increased investors' perception of the likelihood that they will be bailed in. These results hold for both UK and euro-area banks, though they are somewhat weaker for periphery European banks. We show that the degree of progress a bank has made in issuing bail-in bonds is positively related to the level and risk sensitivity of such bonds. We show that the higher level and risk sensitivity of spreads on bail-in bonds are largely invariant to whether bail-in bonds are contractually subordinated (ie issued as non-preferred senior) or structurally subordinated (ie issued from the holding company), and the effects are also unaffected by whether or not a bank is classified as a global systemically important bank (G-SIB). Finally, we show that the results are robust to changes in the strategy or risk profile of individual banks, via the inclusion of time-varying bank-specific effects.

Key words: Banks, bank resolution, financial stability, bail-in.

JEL classification: G21, G28, G33.

(1) Bank of England. Email: ryan.lindstrom@bankofengland.co.uk
(2) Bank of England. Email: matthew.osborne@bankofengland.co.uk

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Bank of England, Threadneedle Street, London, EC2R 8AH
Email enquiries@bankofengland.co.uk

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1. Introduction

In the aftermath of the global financial crisis of 2008-09 and the European sovereign debt crisis of 2011-12, authorities sought ways to reduce the extent to which governments would be compelled to use public funds to avoid the costs and wider contagion from the failure of large banks. In the European Union, a new resolution regime has been implemented via the Banking Recovery and Resolution Directive (BRRD). This has introduced changes to the creditor waterfall which make it easier for losses to be imposed on banks' creditors as part of a resolution process. This is known as 'bail-in' to distinguish it from 'bail-out' using public funds. In line with international standards, banks must meet a minimum requirement for own funds and eligible liabilities (MREL) which is earmarked for loss absorption in the event of resolution. Liabilities eligible for MREL include regulatory capital, including equity and subordinated bonds, and a new class of senior "bail-in" bonds.[1] Several recent papers have assessed the market impact of bail-in events during the euro area crisis and steps in the legislative process for the BRRD. These studies use event study methodology to show that investors react to events that indicate they are more or less likely to be bailed in (Giuliana 2019, Schaefer et al 2017, Crespi et al 2019).

Our paper builds on this previous literature using a database of credit spreads on large European banks from 2010Q1 to 2019Q1, spanning both the sovereign debt crisis and the period since BRRD was implemented. Consistent with previous studies, we show that credit spreads on banks' bonds are sensitive to measures of credit risk at the issue and issuer level, and to broad corporate credit conditions, and the level of risk sensitivity is increasing in the degree of subordination of a bond. We further show that the risk sensitivity of senior bond spreads has increased since the implementation of the BRRD in 2015, suggesting that the introduction of the new bail-in regime resulted in a sustained change in investors' perception of the likelihood of being bailed in. The new senior 'bail-in' (or MREL) bonds are found to have a risk premium of around 45 basis points relative to comparable non-bail-in senior bonds in the post-BRRD period, and bail-in bonds are also more risk sensitive. These effects hold for banks in the UK and core European countries, but are somewhat weaker for banks in peripheral European countries.

We present additional evidence that these effects are indeed linked to investors' perception of an increased likelihood of bail-in. We use each bank's progress in issuing bail-in bonds as an indicator of the likelihood of bail-in, as this signals to the market the relevant authority's willingness to subject the senior bondholders to bail-in. The higher level and risk sensitivity of bail-in bonds, relative to non-bail-in bonds, is found to be increasing in a bank's progress

[1] A wide range of liabilities could be bailed-in during a resolution, and the BRRD states the "bail-in tool may be applied to all liabilities" of a bank, with only certain limited exceptions. However, only certain bonds are eligible as MREL and earmarked for loss in resolution, and hence we refer to these as "bail-in" bonds throughout the paper.

in issuing bail-in bonds. This is consistent with the idea that building a stock of bail-in bonds increases the perceived likelihood that a bank would be bailed in.

We also show that the level and risk sensitivity of spreads on bail-in bonds relative to non-bail-in bonds are not significantly different between global systemically important banks (G-SIBs) and other banks. The greater systemic importance of these banks might mean that their credit spreads contain a larger implicit subsidy from government support (Pablos Nuevo 2019) and investors in these banks may consider that they are less likely to be bailed in than investors in other banks. We find no evidence, however, that the bail-in bond premium, or the risk sensitivity of bail-in bonds relative to other senior bonds, is significantly different for G-SIBs' bonds. The absence of such an effect suggests that the bail-in regime is seen as effective both for systemically important banks and other banks.

We also assess whether the results differ depending on how banks have chosen to meet the requirement to issue bail-in bonds. Prompted by resolution authorities, banks have adopted two broad approaches to issuing bail-in bonds. In the UK and Ireland, bail-in bonds are issued from the holding company (HoldCo) in order to be structurally subordinated to the operating liabilities of the bank. The second approach, adopted in most euro area jurisdictions, is the issuance of bonds which are contractually or statutorily subordinated to operating liabilities, which are known as 'non-preferred senior' (NPS) bonds. We show that these two types of bail-in bonds have similar effects in terms of the bail-in bond premium and both are more risk sensitive than non-bail-in bonds.

We carry out a robustness check in which we control for a full set of bank- and time-specific effects to remove any source of bank- and time-specific variation, such as changes in management or strategy, or increases in a bank's balance sheet strength (e.g. higher capital ratio or liquidity), so that the results only reflect differences between bonds within each bank. The results are largely unchanged, providing further support for our conclusions.

Our findings contribute to a large prior literature on the risk sensitivity of banks' credit spreads, which addresses questions including whether subordinated debt investors impose market discipline on banks via the credit spread, and what credit spreads tell us about the perceived likelihood that banks will be bailed out by governments in the event of distress. In general, studies across countries and over time have shown that the risk sensitivity of spreads on banks' subordinated bonds is stronger where authorities have credibly reduced the perceived probability of government support. In the US, studies of the late 1980s found limited or no relationship between credit spreads and measures of banks' risk (Avery, Belton, and Goldberg, 1988; Gorton and Santomero, 1990). Subsequently, many bondholders experienced losses in the savings and loan crisis of the late 1980s, and the withdrawal of state support was formalised in the FDIC Improvement Act of 1991. A positive relationship between credit spreads and measures of bank risk then emerged in the early 1990s, which was attributed to declining perceptions that banks were 'too big to fail'

(Flannery and Sorescu 1996; De Young et al., 2001; Hancock, and Kwast, 2001; Jagtiani and Lemieux, 2001; Morgan and Stiroh, 2000; Fan et al, 2003; Allen, Jagtiani, and Moser, 2001; Jagtiani, Kaufman, and Lemieux, 2002; Flannery and Nikolova, 2003; Krishnan, Ritchken and Thomson, 2005; Balasubramaniam and Cyree, 2011; Evanoff et al., 2011). While most studies have focused on the US, Sironi (2003) found evidence that subordinated debt spreads of European banks had become more sensitive to risk over the 1990s, and that this was related to the perceived probability of government intervention. Moreover, Imai (2007) also found that subordinated debt investors charged more to weaker and lower rated Japanese banks.

A more recent study by Acharya et al (2016) found that risk sensitivity of spreads is lower for larger banks, which they attribute to a perception amongst investors that these banks are too big to fail (TBTF). They also found that risk sensitivity fell following government support measures during the 2008 financial crisis, in particular the rescue of Bear Sterns and the TARP programme, consistent with the idea that investors respond to changes in the perceived likelihood of government support. Mikosek (2016) shows that the spread between sovereign and bank CDS has fallen for European banks since 2015, which he attributes to a reduced TBTF premium (see also Zaghini, 2014). Pablos Nuevo (2019), however, finds no evidence of a significant widening of spreads between subordinated bonds and senior bonds of European banks after the introduction of the new bail-in framework. Conversely, work by Pancotto et al (2019), finds there has been no significant weakening in the interaction between bank and sovereign CDS spreads, compared to spreads for the non-financial corporate sector, since the BRRD. They find the gap between bank and sovereign risk narrows, and imply a lack of credibility of the BRRD in financial markets. Lewrick et al (2019) found a risk premium for bail-in bonds relative to other senior bonds and that this premium is higher for riskier issuers, consistent with the idea that bond investors exert market discipline on banks. Various studies have used market prices to estimate the size of the subsidy from implicit government support (see Siegert and Willison, 2015, for a review) and the effect of recent policy to designate certain banks as globally systemic (Moeninghoff et al, 2015).

Our paper is closely related to several recent papers which examine the market reaction to bail-in events that occurred during the euro area sovereign debt crisis of 2012-13. During this period a number of banks were resolved, either with or without losses being imposed on private creditors (e.g. Banca Monte dei Paschi di Siena, Bankia, and several Cypriot banks). Schaefer et al (2017) found that CDS prices and stock returns fell after the bail-in of private creditors. The effects were sensitive to which parts of the capital stack were subject to losses (e.g. the effects on senior unsecured were stronger when this class was included in the bail-in), and where the bail-in event had greater political spillovers (e.g. involvement of supranational authorities). Similarly, Giuliana (2019) found that credit spreads responded to the bail-in of private creditors. In particular Giuliana finds a widening of the spread between the unsecured portion (which is potentially subject to bail-in) and the secured portion (non-bail-in) of the capital stack, following bail-in episodes. Giuliana finds an increase in the risk sensitivity of bonds in the immediate aftermath of bail-in events, and that steps in the legislative process for the BRRD also affected spreads. Crespi et al (2019) find that the credit spreads of Italian banks rose, and became more risk sensitive, following the introduction of the BRRD.

As these papers rely on event study methodology they show the immediate impact of events which reveal information to the market indicating a higher or lower likelihood of bail-in. Our paper builds on this prior literature by showing that there has also been a sustained change in investors' perceptions of the riskiness of banks' bonds, and this is linked to the establishment of a new resolution framework in 2015 and, in particular, to the creation of a new class of loss-absorbing bail-in bonds. We observe below that the level and risk sensitivity of bond spreads declined once the euro area crisis ended in 2012, suggesting that the effects noted by the event studies above may have been temporary. In short, event study approaches are able to establish a more robust causal link between market moves and changes in the likelihood of bail-in, but do not show the effects beyond the relevant time window. Our research fills this gap.

The paper is structured as follows. In section 2 we provide background on the new bail-in framework introduced in the EU by the BRRD. Section 3 summarises our dataset and methodology. Section 4 details the results. Section 5 concludes.

2. The bail-in framework

The bail-in framework was introduced in stages. In 2013, the G20 called on the FSB to develop proposals on the total loss absorbing capacity (TLAC) of global systemically important financial institutions. Following a 2014 consultation, the FSB published a TLAC term sheet in 2015. This set out targets for loss absorbing capacity for the largest banks globally (G-SIBs). The EU rules over loss absorbing debt are determined by the BRRD. This sets a Minimum Requirement of own funds and Eligible Liabilities (MREL) for EU banks. MREL is consistent with the TLAC standard, and applies to all EU firms (not just G-SIBs).

The rules for bonds to be MREL eligible are set in each jurisdiction by the resolution authority; for example the Single Resolution Board (SRB) sets MREL for banks in the euro area that are supervised by the ECB, while the Bank of England sets MREL for UK banks (see Chennells and Wingfield, 2015 or Cunliffe 2016 for an overview). All subordinated debt is eligible, if it counts towards own funds (i.e. regulatory capital). For senior debt, the aim is to create a new class of senior debt which is subordinated to other senior liabilities which are less suitable for bail-in, such as derivative liabilities and deposits. Jurisdictions have adopted three approaches to achieve this. The first is statutory subordination, in which a change in the law subordinates a class of bondholders (known as non-preferred senior or NPS bonds). Germany is the main example, as they passed a law taking effect in January 2017 which subordinated existing senior bondholders to other senior creditors.[2] From that time onward, German banks were then able to issue 'preferred senior' debt which was not MREL-eligible.

The second approach is contractual subordination, in which the terms of a bond state that it is subordinated to other (senior) liabilities. Such bonds are known as non-preferred senior (NPS). Most other euro area jurisdictions have taken this approach, including France, Italy and Spain. Finally, bonds can be issued from the holding company (HoldCo), so that they are structurally subordinated to liabilities issued from the operating company. In the UK, Andrew Gracie indicated in 2014 that UK banks would need to take this approach (except for building societies which use NPS).[3] Some issuers from Belgium, Ireland and the Netherlands also use the HoldCo approach (see Monfared, 2018 and Hopker et al, 2017 for more detail of these regimes).

In July 2019, the FSB published a review of TLAC implementation, concluding G-SIBs had made steady progress issuing TLAC debt, boosting market confidence in authorities' ability to address too-big-to-fail risks. This matches the view of rating agency analysts, who have reduced the uplift in banks' credit ratings due to the likelihood of government support (see Carney, 2019, Moody's, 2015a and 2015b). They note that more subordinated and lower rated debt trades at wider spreads, especially since the bail-in of certain creditors of Banco Popular and Monte Paschi di Siena in 2017 (Ventoruzzo and Sandrelli, 2019).

The timing of bail-in bond issuance has varied, as issuance was delayed in some jurisdictions until rules were clear, and issuance has still not begun for a few issuers. Table 1 summarises progress across the large banks in our sample.

[2] Exceptionally, when the Dutch government implemented the EU directive in December 2018, at that time it converted some Rabobank bonds that had been issued a few months prior into NPS.
[3] See also a speech by Sir Jon Cunliffe, https://www.bankofengland.co.uk/-/media/boe/files/article/2016/ending-too-big-to-fail-how-best-to-deal-with-failed-large-banks

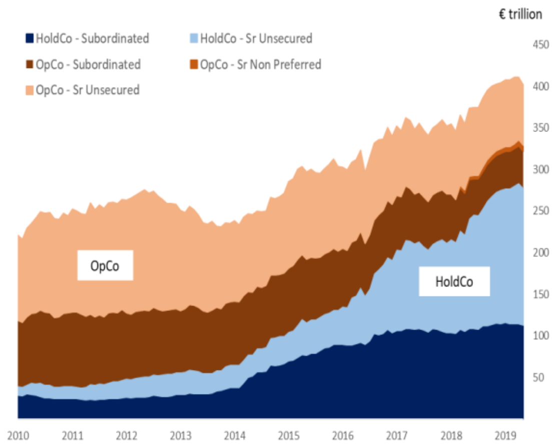
Table 1: MREL implementation and issuance by jurisdiction

Institution	MREL type	Senior MREL	MREL regulation
Allied Irish Bank	HC	22-Mar-18	9-Jul-15
Bank of Ireland	HC	22-Aug-18	
Barclays	HC	25-Sep-14	01-Nov-16
Clydesdale Bank	HC	19-Jun-2017	
HSBC	HC	… 2009	
Lloyds	HC	30-Jun-16	
Nationwide	NPS	01-Mar-18	
RBS	HC	… 2009	
Santander UK	HC	13-Oct-15	
Standard Chartered	HC	14-Jan-13	
Banque Postale	NPS	04-Oct-17	10-Dec-16
BNP Paribas	NPS	03-Jan-17	
BPCE	NPS	18-Jan-17	
Credit Agricole	NPS	03-Jan-17	
SocGen	NPS	14-Dec-16	
KBC	HC	20-Apr-16	31-Jul-17
Commerzbank	NPS	01-Jan-17	01-Jan-17
Deutsche Bank	NPS	01-Jan-17	
LBBW	NPS	01-Jan-17	
Sabadell	NPS	30-Apr-19	25-Jun-17
Santander	NPS	26-Jan-17	
Bankia	NPS	18-Mar-19	
BBVA	NPS	20-Feb-19	
Caixabank	NPS	31-Aug-17	
Intesa SP	NPS	[Not yet]	01-Jan-18
Unicredit	NPS	11-Jan-18	
Erste	NPS	15-May-19	01-Jul-18
Danske	NPS	14-May-18	01-Jul-18
NyKredit	NPS	10-Jul-18	
Svenska HB	NPS	[Not yet]	29-Dec-18
Nordea	NPS	15-Jun-18	
SEB	NPS	[Not yet]	
Swedbank	NPS	[Not yet]	
ABN	NPS	[Not yet]	18-Oct-18
ING	HC	01-Mar-17	
Rabobank	NPS	22-Aug-18	

Figures 1 and 2 show the breakdowns of the book value of outstanding unsecured debt for UK banks and EA banks in our sample. Some UK banks had issued senior debt from their HoldCos before BRRD (HSBC, RBS, Standard Chartered). Since 2014, when Andrew Gracie confirmed the BoE's expectations, the value of bonds issued from the HoldCo has increased, and this is partly offset by a fall in value of bonds issued from the OpCo. A small amount of NPS can be observed from 2018, which is issued by Nationwide building society. The tranche of subordinated debt also increases in size from late 2013 onwards, which is likely to reflect the transition to higher regulatory capital requirements under Basel III. Note that as banks issue in various currencies (mostly USD, EUR or GBP), and this is converted into euros for the chart, currency fluctuations result in volatility in the total value of bonds.

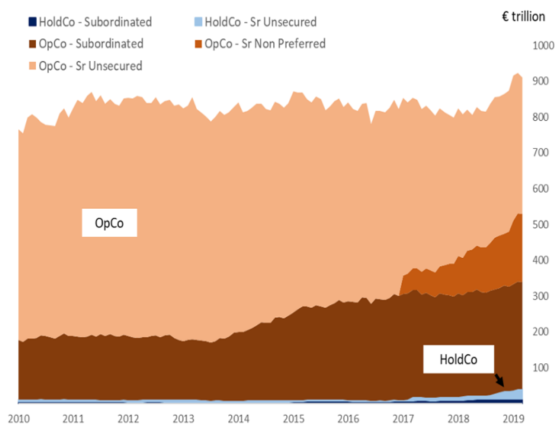
In the euro area, a tranche of NPS bonds appears in 2017 (following the German legislation mentioned above) and grows rapidly in size thereafter. There is a small amount of HoldCo issuance, reflecting certain banks in the Netherlands, Ireland and Belgium, which also increases in size from 2017. As shown in Table 1, Euro area banks started issuing bail-in bonds later than UK banks, and they have made less progress. European banks have around 60% of unsecured bail-in liabilities compared to around 80% in the UK.

Figure 1: Amount outstanding of bonds issued at different parts of the capital stack for selected UK banks



Sources: Bloomberg Finance L.P., Refinitiv, and Bank calculations

Figure 2: Amount outstanding of bonds issued at different parts of the capital stack for selected European banks

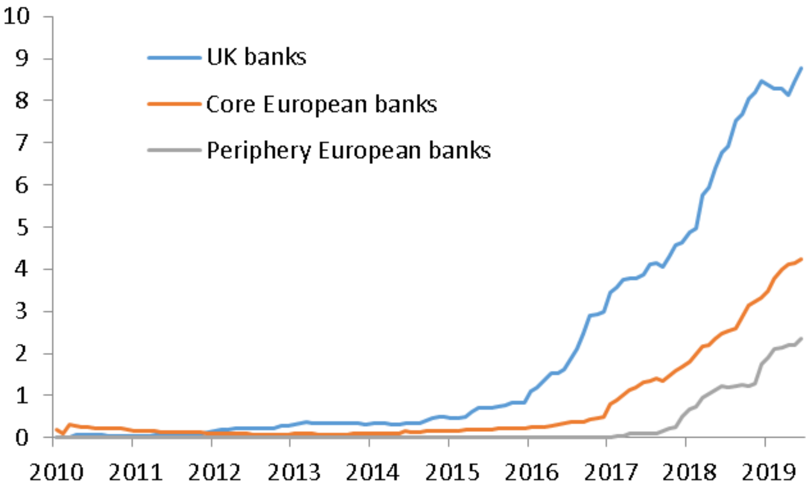


Sources: Bloomberg Finance L.P., Refinitiv, and Bank calculations

Banks' progress issuing MREL bonds is summarised in Figure 3, which shows the average ratio of MREL bonds to risk-weighted assets across UK banks, core European banks and periphery European banks in our sample (the annex includes a summary table by individual banks). As discussed above, UK banks began to issue first and continued to make faster progress, ending in 2019 with an average of around 8.8% compared to 4.2% for core

European banks. Periphery banks started issuing MREL bonds later and have made less progress than other banks, ending in 2019 with a ratio of around 2.4%.

Figure 3: Banks' progress issuing bail-in (senior MREL-eligible) bonds



Sources: Bloomberg Finance L.P. Refinitiv and Bank calculations. Figure shows the percentage of MREL bonds over risk-weighted assets, expressed as a simple average across banks in the UK, core Europe and periphery Europe.*

The slower application of bail-in rules in some peripheral jurisdictions (Italy, Spain, Portugal) means that although government support is discounted and the resolution regime is partly effective, bank issuers from those regions do not always receive a rating benefit from a thicker, more loss absorbent layer of bail-in debt see, e.g. S&P 2019.

Table 2 summarises the minimum external TLAC required to cover losses under regulatory capital requirements (including Pillar 1, the minimum capital requirement common to all banks, and Pillar 2, which is set by supervisors for each bank) and subsequent recapitalisation for firms in the UK and the euro area. This minimum is expressed as a percentage of Risk Weighted Assets (RWA) and also as a percentage of the Basel 3 Leverage Ratio Denominator (LRD); and does not include buffers or additional firm-specific requirements. The requirements are phased in over 2019-2022.

Table 2: Minimum external TLAC calibration[4]

	2019	2020	2022
UK	• 16% RWA • 6% LRD	• (2x P1 RWA requirement) + P2 RWA requirement • Higher of 2x leverage ratio requirement or 6% LRD	• (2x P1 RWA requirement) + P2 RWA requirement • Higher of 2x leverage ratio requirement or 6% LRD
Euro area	• 16% RWA • 6% LRD		• 18% RWA + MREL add-on • 6.75% LRD + MREL add-on

3. Data and methodology

As set out in Table 1 above, we identify 37 large banks from 11 European jurisdictions (Austria, Belgium, Denmark, France, Germany, Italy, Ireland, Netherlands, Spain, Sweden, UK).[5] These are drawn from the list of global systemically important institutions (G-SIIs) published by the European Banking Authority (EBA).[6] We also include several other large banks which are not on the EBA list, because they have a HoldCo approach to issuing bail-in bonds: CYBG PLC (UK), AIB PLC (Ireland) and Bank of Ireland (Ireland).

We use a Bloomberg search to identify bonds issued by these issuers or their subsidiaries meeting the following criteria: (i) amount issued is greater than £500 million; (ii) issued in the last 30 years and maturing after 2008; (iii) unsecured bonds which are either senior, subordinated or junior subordinated; and (iv) bonds with a fixed coupon. We obtained bond characteristics such as amount issued, currency and coupon and time series for the credit spread, issue ratings and amount outstanding between Q1 2010 and Q1 2019 from Bloomberg and Eikon. Macro-financial variables are taken from Bloomberg or Thomson Reuters Datastream.

As a measure of issue-specific credit risk, we calculate a numeric index of credit ratings for each bond. For each of the Fitch, S&P and Moodys ratings, we convert the rating into a numeric scale ranging from 1 for AAA (S&P/Fitch) or Aaa (Moodys), up to 17 for CCC+ (Fitch), CCC (S&P) or Caa1 (Moodys) or lower. We then calculate a composite rating index by taking the average of the three ratings, or whichever subset of them is available for a given bond. A higher value of this index indicates higher risk.

[4] From the External TLAC calibration and phase-in in the FSB Review of the Technical Implementation of the TLAC Standard (July 2019). Our data also includes some banks that are not systemically important.
[5] We treat Santander UK as a banking group in its own right, even though it is a subsidiary of Banco Santander, as this group has a multiple point of entry resolution arrangement in which Santander UK would be resolved separately from the wider group.
[6] See https://eba.europa.eu/risk-analysis-and-data/global-systemically-important-institutions.

As a measure of issuer-specific credit risk we use the probability of default available via the Eikon Starmine dataset. The Starmine model is an expanded version of the standard structural Merton model in which the probability of default is a function of the level and volatility of the share price and the degree of leverage within the bank's liability structure. The output is a measure of the probability that the market value of assets will fall below a default point, based on the company's liabilities, within one year. It is only available for publicly listed banks.

As a further measure of issuer credit risk, we incorporate accounting variables measuring the strength of the bank's balance sheet. These include the tier 1 risk-weighted capital ratio, ratio of liquid assets to wholesale funding, the ratio of risk-weighted assets to total assets, the return on equity and the ratio of loan loss reserves to total loans. These data are sourced from SNL Financial and merged with the market data using the legal entity identifier (LEI) for each bank.

Data are stacked according to the most recent observation available at each date, as this represents the most recent data available to the market. For example, for a quarterly macro variable such as GDP, we use the value corresponding to the previous quarter, from the date at which the data was released. We used asset swap spreads as the spread measure for most bonds; where this was unavailable we used the Z-spread; if the Z-spread was not available either, we dropped the observations. We exclude any bonds without spread data. Our final sample includes just over 1.1 million daily observations from 1428 bonds.

We use daily quoted secondary market spreads as our dependent variable. This contrasts with some previous studies which have used primary market data, i.e. the spread at time of issue (e.g. Sironi, 2003). These studies have cited poor liquidity in the secondary market, which may mean that prices quoted in the market do not reflect actual transactions. As noted in section 3 above, we have excluded bonds without secondary spreads from the sample. We have analysed data on bond transactions in order to gauge the liquidity of the bonds in our sample, and the results are shown in Table 3. Bonds trade on average once or twice per day, and at least once per month. The volume traded each month is around 5% of the amount outstanding on average. We have also estimated the within-bond standard deviation of bond credit spreads as 159 basis points. Market intelligence suggest that banks' bonds typically trade more frequently in the months immediately after issuance.[7] Although not as liquid as some other risky assets (like equities), market intelligence suggests that bank bonds are liquid for relatively frequent bank issuers (compared to corporate

[7] These views are based on discussions with Bank of England market contacts in bank funding markets, which include UK, European, and other bank issuers, debt capital markets (DCM) and syndicate contacts pricing primary issuance, and investors such as asset managers.

issuers) and secondary market spreads are commonly used to price new issuance. We conclude that the bonds are sufficiently liquid for our analysis.

Table 3: Summary of liquidity of bonds

	Number of trades per month				
	Minimum	25th percentile	Median	75th percentile	Maximum
Subordinated	1	27	68	140	2808
Senior - bail-in	1	22	53	103	1437
Senior - non-bail-in	1	17	38	74	1443

	Monthly volume, as percentage of amount outstanding				
	Minimum	25th percentile	Median	75th percentile	Maximum
Subordinated	0.0002%	2.6%	6.3%	12.8%	1226.8%
Senior - bail-in	0.001%	2.2%	5.9%	13.6%	205.2%
Senior - non-bail-in	0.00001%	1.5%	3.5%	7.4%	297.9%

Sources: Bloomberg Finance L.P. and Bank calculations

In terms of which control variables to include, the Merton model suggests that these should include the asset/portfolio risk of the issuer (+), the issuer's leverage ratio i.e. equity/assets (-), maturity (-) and the risk-free rate (-). Various studies cited above have confirmed that these factors are empirically relevant. Other factors found by previous studies to be important include the amount outstanding of the bond and measures of macroeconomic activity such as GDP growth or the unemployment rate. Studies have also examined the role of accounting measures of banks' financial strength such as capital ratios, loan loss reserves and liquid asset ratios. These are generally found to perform relatively poorly in explaining credit spreads (Zhang et al, 2014; Imai 2007; Sironi, 2003), an issue to which we return below.

Our baseline model is as follows:

$$(1)\ S_{ijt} = \alpha + \alpha_j + \tau_t + \gamma \times BOND_{it} + \delta \times BANK_{jt} + \eta \times MKT_t + \varepsilon_{ijt}$$

S_{ijt} is the bond spread of bond *i*, issued by bank *j*, at time *t*. $BOND_{it}$, $BANK_{jt}$ and MKT_t are vectors of control variables, each of which includes measures of credit risk. $BOND_{it}$ is a vector of bond-specific control variables, including the issue rating (our measure of issue-specific credit risk), amount outstanding, remaining maturity and the currency. $BANK_{jt}$ is a vector of bank-specific control variables, including the probability of default, the Tier 1 capital ratio, ratio of liquid assets to wholesale funding, the ratio of risk-weighted assets to total assets, the return on equity and the ratio of loan loss reserves to total loans (all of these are used as issuer-specific risk measures). We also incorporate the ratio of MREL bonds issued by a bank to total senior bonds issued by the bank (PROGRESS). MKT_t is a vector of time-specific macro-financial variables, including a broad investment grade corporate credit index (using a standard index produced by Bank of America Merrill Lynch), quarterly GDP growth, the slope of the yield curve (spread between a 10 year bond and 3 month money market rate), short-term rate (3 month rate) and a measure of the volatility of the yield curve (SMOVE measure of swaption implied volatility). The investment grade credit index is used as a measure of credit risk across in the economy as a whole. For the macro-financial variables, the series corresponding to the relevant currency or region is used for each bank; so for example, for a UK bank we would use UK GDP growth and GBP credit spreads, and for a German bank we would use euro area GDP growth and euro credit spreads. We also include monthly time dummies (τ_t) and bank fixed effects (a_j). Standard errors are clustered by bank.

Table 4 shows summary statistics for our dataset.

Table 4: Summary statistics

	All		**UK**		**Core EA**		**Periphery EA**	
	Mean	**St. dev.**	**Mean**	**St. dev.**	**Mean**	**St. dev.**	**Mean**	**St. dev.**
Risk measures								
Spread (bps)	181.8	186.9	212.3	191.1	149.7	174.2	229.1	199.7
Issue rating*	7.4	2.6	7.6	2.5	6.8	2.5	9.4	2.1
Probability of default (%)	0.5	0.8	0.4	0.6	0.6	0.8	0.6	1.0
Investment grade corporate index (bps)	141.7	46.4	168.1	46.0	129.1	40.9	127.9	40.7
Bond characteristics								
Coupon (%)	4.3	2.3	5.0	2.4	3.8	2.0	4.3	2.1
Remaining maturity (days)	1802.9	1507.6	2236.2	2131.2	1636.9	1045.8	1437.3	906.0
Bond size (log £ amount outstanding)	20.5	0.6	20.4	0.9	20.6	0.4	20.5	0.5
Bank characteristics								
PROGRESS (%)	0.5	0.8	1.0	1.0	0.3	0.6	0.2	0.4
Loan loss reserves (%)	2.4	2.0	1.8	1.7	2.0	1.3	5.5	2.5
Tier 1 ratio (%)	15.1	3.9	16.0	4.7	15.2	3.6	13.1	2.2
Risk-weighted assets ratio (%)	31.2	10.4	31.6	9.7	26.6	5.8	46.4	9.6
ROE (%)	5.6	9.9	3.6	7.2	7.2	8.1	4.5	17.2
Liquid assets ratio (%)	61.9	36.7	63.4	40.8	66.6	36.7	42.5	13.1
Macro-financial controls								
3m Libor (GBP / EUR, %)	0.2	0.5	0.6	0.2	0.0	0.5	0.0	0.5
Slope (GBP / EUR, %)	0.9	0.6	1.1	0.7	0.8	0.5	0.8	0.5
SMOVE index (GBP / EUR)	51.2	18.6	61.4	13.0	46.4	18.9	45.8	18.9
GDP growth (UK / EA, %)	0.4	0.3	0.5	0.3	0.4	0.3	0.4	0.3
Currency	**% of obs.**		**% of obs.**		**% of obs.**		**% of obs.**	
USD	30%		34%		31%		16%	
EUR	58%		38%		63%		83%	
GBP	12%		27%		5%		1%	
Other	1%		1%		2%		0.3%	
No. of observations	1,142,149		372,230		602,311		167,608	
No. of banks	36		8		19		9	
No. of bonds	1,428		436		759		233	

Sources: Bloomberg Finance L.P., Refinitiv, and Bank calculations

**Rating is defined using a composite index ranging from 1 for the highest rating to 17 for the lowest, see above for more details.*

Note: Core European jurisdictions are Germany, France, Netherlands, Austria, Belgium, Denmark and Sweden; periphery European jurisdictions are Spain, Italy and Ireland.

4. Results

In this section we present our baseline model of the risk sensitivity of bond spreads. We then organise our further analysis around our hypotheses as below:
H1: If investors in bank debt perceive there is a likelihood that they will be bailed in if a bank is in resolved, then bank credit spreads will be sensitive to measures of risk, and risk sensitivity will be increasing in the degree of subordination of a bond.
H2: If the resolution framework has been successful in raising the perceived likelihood that bond investors will be bailed in, then the risk sensitivity of credit spreads would have risen after the framework was introduced.
H3: If issuance of bail-in bonds increases investors' perception of the likelihood of bail-in the level and risk sensitivity of spreads on bail-in bonds should be higher relative to non-bail-in bonds

We present several additional tests to gather more information on the impact of the new framework:

- We test whether the degree of progress made by banks in issuing bail-in bonds should be associated with a higher level and risk sensitivity of spreads.
- We test whether the differences between bail-in and non-bail-in bonds are different for G-SIBs and non-G-SIBs;
- We test whether issuing bail-in bonds via the holding company or non-preferred senior approach has different effects in terms of increased risk of these bonds.
- Finally, we show the results of a robustness test in which we include bank- and time-specific effects, in addition to time effects and bank effects in the base specification, in order to control for bank=specific changes in strategy or risk profile.

a) Results from the baseline model

In order to test H1 and refine the specification of the test of our hypotheses, we first show a set of baseline models. These models are estimated across the whole sample period, and aim to establish which measures of risk are most important for the credit spreads of bonds in our sample, and to verify the set of control variables which we have included. The results from our baseline model (1) are shown in Table 5. Overall these results support the findings of previous studies (reported above) that credit spreads are significantly and positively associated with measures of credit risk. In the baseline models we estimate separate equations for subordinated and senior bonds, and these show that risk sensitivity is higher for subordinated bonds, consistent with H1.

Three specifications are shown each of which focuses on a different measure of risk. Columns 1a and 1b show the results using issue ratings, which are our measure of issue-specific credit risk. Issue ratings are shown to be strongly positively correlated with credit spreads, with a 1-notch downgrade associated with a 21bps increase in spreads for senior bonds and a 60bps increase for subordinated bonds. Columns 1c and 1d show the bank-specific probability of default, which is our measure of issuer credit risk. This is also positively correlated with credit spreads, with a 1 percentage point increase in the probability of default associated with a 27bps increase in senior spreads and a 46bps increase in subordinated bond spreads. Columns 1e and 1f show the results using variables measuring the strength of the issuing bank's balance sheet. While these variables generally have the expected signs, only the risk-weighted assets ratio (for senior bonds) and the return on equity (for senior and subordinated bonds) are statistically significant. The mixed performance of these balance sheet variables is consistent with other studies and has been attributed to measurement issues (Sironi 2003, Zhang et al 2014). In particular, the definition of some of these variables may differ across jurisdictions, and may have changed over time (e.g. the tier 1 capital ratio and risk-weighted assets ratio have been subject to various changes. This is complicated by older analysis (see Pop 2009), showing that subordinated debt issuance mostly came from the largest and most profitable European banks, allowing them to reduce their Tier 1 ratio decreasing the quality of capital supporting older forms of senior debt, and the amount of subordinated debt was negatively correlated with the quality of the credit portfolio.

The investment grade credit index is positively correlated with credit spreads in all specifications, suggesting that bank credit spreads tend to respond to credit conditions across the corporate sector. In models 1a and 1b which include issue ratings, the coefficient suggests that a 100bps increase in the index increases senior credit spreads by 49bps and subordinated credit spreads by 105bps. The results are similar for the balance sheet models 1e and 1f. The index is however not statistically significant in the probability of default models (1c and 1d). This suggests that broad credit conditions may be reflected in the probability of default measure.

Other variables generally have the expected coefficients. Bonds issued in USD or GBP have a significantly higher spread than those issued in EUR (note EUR is used as the base so is not shown); bonds with higher coupons and longer maturities have higher spreads; interest rate volatility is significantly positively correlated with spreads; and GDP growth has a negative relationship with credit spreads, suggesting stronger macroeconomic conditions are associated with lower spreads. Other bond characteristics and macro-financial controls have generally mixed signs and/or low significance.

Table 5: Results from baseline regression models

	(1a)	(1b)	(1c)	(1d)	(1e)	(1f)
	With issue ratings		With probability of default		With balance sheet variables	
	Senior	**Subordinated**	**Senior**	**Subordinated**	**Senior**	**Subordinated**
Risk measures						
Issue rating	21.25***	60.34***				
	(3.52)	*(6.9)*				
Probability of default			27.35***	45.66***		
			(8.94)	*(14.19)*		
Loan loss reserves					-2.7	4.34
					(4.52)	*(10.04)*
Tier 1 ratio					1.13	2.9
					(1.34)	*(3.17)*
Risk-weighted assets ratio					1**	0.15
					(0.45)	*(2.55)*
ROE					-0.52***	-1.29*
					(0.17)	*(0.76)*
Liquid assets ratio					-0.06	-0.09
					(0.09)	*(0.34)*
IG index (GBP / EUR)	0.49***	1.05***	0.28	0.38	0.44***	1.04**
	(0.16)	*(0.32)*	*(0.18)*	*(0.31)*	*(0.13)*	*(0.51)*
Bond characteristics						
Currency = USD	47.67***	27.1*	50.34***	43.12	48.46***	55.04**
	(3.52)	*(13.43)*	*(5.996)*	*(26.93)*	*(4.82)*	*(24.18)*
Currency = GBP	39.92***	58.45***	41.85***	34.86	30.61***	55.3*
	(5.39)	*(14.72)*	*(8.84)*	*(23.57)*	*(7.5)*	*(27.97)*
Currency = OTH	7.35	42.85	3.62	-54.41	7.27	-36.94
	(6.56)	*(28.73)*	*(9.66)*	*(70.89)*	*(10.65)*	*(50.03)*
Coupon	0.78	4.31	0.06	20.57***	2.62*	25.56***
	(1.1)	*(2.99)*	*(1.65)*	*(3.78)*	*(1.55)*	*(4.33)*
Maturity	0.02***	0.01***	0.02***	0.01**	0.02***	0.01*
	(0.002)	*(0.004)*	*(0.002)*	*(0.003)*	*(0.002)*	*(0.003)*
Bond size	1.83	15.4**	4.82	-14.17*	-1.45	-10.22
	(3.75)	*(7.11)*	*(4.87)*	*(6.95)*	*(6.04)*	*(9.12)*
Macro-financial						
3m Libor (GBP / EUR)	-2.41	67.82	6.16	9.5	-11.95	18.33
	(19.84)	*(57.01)*	*(17.24)*	*(34.33)*	*(16.4)*	*(49.18)*
Slope (GBP / EUR)	7.34	27.58	-3.54	-43.36	0.96	32.18
	(14.26)	*(30.33)*	*(10.03)*	*(25.35)*	*(12.8)*	*(40.3)*
SMOVE index (GBP / EUR)	0.14*	0.57***	0.15**	0.76***	0.09	0.61**
	(0.07)	*(0.19)*	*(0.07)*	*(0.2)*	*(0.09)*	*(0.28)*
GDP growth (UK / EA)	-15.87**	-18.59	-13.73*	-51.28*	-26.03***	-68.97*
	(7.76)	*(25.26)*	*(7.36)*	*(25.29)*	*(9.04)*	*(34.81)*
Number of observations	656793	485356	433430	352940	562394	377266
Number of bonds	917	511	643	386	859	459
R-squared	0.70	0.62	0.69	0.42	0.66	0.47
Bank effects	YES	YES	YES	YES	YES	YES
Year-Month effects	YES	YES	YES	YES	YES	YES

Notes: *** indicates statistically significance at 1% level, ** at 5% and * at 10%. Standard errors are shown in brackets. The table shows our baseline model (1) estimated for all banks and bonds over the period Q1 2010- Q1 2019. OLS with standard errors clustered at the bank level. Bank effects (a dummy for each bank) and time fixed effects (year-month dummy variables) were also included.

These results confirm that bank credit spreads are sensitivity to our measures of issue-specific credit risk (issue rating), issuer-specific credit risk (probability of default), and broad corporate credit conditions (IG index). The results also confirm that risk sensitivity is greater for subordinated bonds than for senior bonds. This suggests that these risk measures are appropriate for testing whether a greater perceived likelihood of being bailed in would result in higher risk sensitivity, and in particular higher risk sensitivity of bail-in bonds relative to other senior bonds. As a result of the mixed performance of balance sheet measures in the baseline model, we do not use the balance sheet measures in the tests of our hypotheses on the risk sensitivity of credit spreads below.

b) Have bond spreads been impacted by the introduction of the new bail-in framework?

To assess hypothesis H2, we amend the baseline model to estimate how the risk sensitivity of credit spreads has changed over time. We divide the sample period into three sub-periods: the euro area crisis (2010-12), the post-crisis period (2013-14) and the post-BRRD period (2015-19). As the previous section made clear, there were multiple steps in the introduction of the new framework, including the legislative process resulting in the BRRD, FSB announcements about TLAC, and the implementation of MREL requirements in local jurisdictions. 2015 is chosen as the start of the post-BRRD period as this is when BRRD had been implemented, and (as described above) ratings agencies announced during this year that they would reduce the amount of government support in ratings to reflect the changes in the regulatory framework.

We amend equation (1) to allow the coefficients on our selected measures of risk ($RISK_{ijt}$) to vary between these three periods, as shown in equation (2). Our risk measures (issue rating, probability of default and IG index) are each interacted with a dummy variable taking the value 1 in the period 2010-2012 ($CRISIS_t$) and a dummy variable taking value 1 in the period 2015-19 ($BRRD_t$). The post-crisis period (2013-14) is used as the baseline and hence we do not include a dummy variable for this period. The coefficient on $CRISIS_t$ (φ_1) shows the risk sensitivity during the crisis period relative to the post-crisis period, and a positive value would suggest that the increased risk sensitivity of bonds during the crisis period found by previous studies was not sustained in the crisis period. The coefficient on $BRRD_t$ (φ_2) shows the risk sensitivity in the post-BRRD period relative to the post-crisis period, and a positive value would indicate that risk sensitivity was higher following the BRRD reforms, suggesting that the BRRD framework resulted in investors pricing in a higher probability of being bailed-in. All bond-, bank- and time-specific control variables included in models 1a-1d above continue to be included in $BOND_{it}$, $BANK_{jt}$, and MKT_t, although for brevity we only report the coefficients necessary to test our hypotheses.

(2) $$S_{ijt} = \alpha + \alpha_j + \tau_t + +\gamma \times BOND_{it} + \delta \times BANK_{jt} + \eta \times MKT_t + \beta \times RISK_{ijt} + \varphi_1 \times CRISIS_t \times RISK_{ijt} + \varphi_2 \times BRRD_t \times RISK_{ijt} + \varepsilon_{ijt}$$

Equation (2) is estimated for senior bonds only. β measures the base effect of risk variables, as in the baseline equation above. φ_1 shows how risk sensitivity differs from the base effect in the crisis period (2010-12), relative to the baseline period. Note that the total effect for the crisis period would be $\beta + \varphi_1$. φ_2 shows how risk sensitivity differed in the post-bail-in period (2015-19) relative to the baseline. As risk measures, we use the issue rating, PD and credit index, as these are the measures that show the strongest correlation with spreads in the baseline model.

Table 6 shows the results for senior bonds. This suggests that sensitivity to all three measures of risk was higher during the euro area crisis (2010-12), relative to the baseline period after the crisis had ended (2013-14). Risk sensitivity then rose again following the bail-in reforms (2015-19). This was particularly evident for the UK, for which risk sensitivity was significantly higher in the post-bail-in period, relative to the baseline period, for all three risk measures. The core European jurisdictions also showed significantly higher risk sensitivity in the post-bail-in period for the PD and the index. In contrast, the periphery banks do not show evidence of increased risk sensitivity. These findings are consistent with the idea that the new resolution framework, and the introduction of explicitly bail-in senior bonds, may have increased the perceived likelihood that senior investors may be bailed in, or that their bond spreads are more affected by domestic risk factors, or both.

Table 6: Time-varying coefficients on risk variables

		All	UK	Core Europe	Periphery
Issue rating					
β	*Base effect*	19.46***	7.72**	13.95***	24.89***
φ₁	*Crisis*	28.06***	23.25***	8.23***	31.83
φ₂	*Post-bail-in*	-2.47	5.49*	4.74	21.09
PD					
β	*Base effect*	16.67***	-40.35*	14.02***	4.99
φ₁	*Crisis*	12.8	81.38***	1.75	31.66**
φ₂	*Post-bail-in*	6.91	44.58**	29.92***	11.42
Index					
β	*Base effect*	-0.12	0.4**	0.44***	1.98***
φ₁	*Crisis*	0.47	0.69***	0.35***	0.1
φ₂	*Post-bail-in*	0.64***	0.38***	0.14**	-0.61**

Notes: *** indicates statistically significance at 1% level, ** at 5% and * at 10%. Standard errors are shown in brackets. The table shows equation (2) estimated over the period Q1 2010 - Q1 2019. Estimation used OLS with standard errors clustered at the bank level. Bank effects (a dummy for each bank) and time fixed effects (year-month dummy variables) were also included.

c) Comparing bail-in and non-bail-in bonds

In this section we test the hypothesis that if investors' perception of bail-in has increased, then the level and risk sensitivity of spreads on bail-in bonds should be higher relative to non-bail-in bonds (H3). As explained above, banks have been gradually replacing a portion of their existing senior debt with bail-in bonds, which are either issued from the holding company or contractually subordinated to other senior liabilities. Comparing the level and risk sensitivity of bail-in and non-bail-in senior bonds provides evidence of whether investors consider the former to be more likely to be bailed in. Differences between bail-in and non-bail in senior bonds would also provide reassurance that our results are not due to changes in the underlying asset risk of the issuing bank.

In order to test this hypothesis, we estimate the following equations. Equation (3) is intended to capture differences in the level of spreads between bail-in and non-bail-in bonds. We introduce a dummy variable, $MREL_i$, which takes the value 1 if a bond is eligible to meet a bank's MREL requirement. To construct this indicator we used data available in our Bloomberg dataset, and we also check the classification against a list of eligible bonds produced by market analysts and made available to the BOE's resolution department. Equation (4) aims to capture differences in the risk sensitivity of spreads in these two classes.[8]

(3) $S_{ijt} = \alpha + \alpha_j + \tau_t + \gamma \times BOND_{it} + \delta \times BANK_{jt} + \eta \times MKT_t + \varphi_3 \times MREL_i + \varepsilon_{ijt}$

(4) $S_{ijt} = \alpha + \alpha_j + \tau_t + \gamma \times BOND_{it} + \delta \times BANK_{jt} + \eta \times MKT_t + \beta \times RISK_{ijt} + \varphi_1 \times CRISIS_t \times RISK_{ijt} + \varphi_2 \times BRRD_t \times RISK_{ijt} + \varphi_3 \times MREL_i + \varphi_4 \times MREL_i \times BRRD_t \times RISK_{ijt} + \varepsilon_{ijt}$

φ^3 in equation (3) tells us whether the spread on the bail-in bonds is higher on average than other bonds, while φ^4 in equation (4) tells us whether the bail-in bonds are more risk sensitive than non-bail-in bonds. As above, we focus on three risk measures: the credit index, the probability of default and the issue rating. These three risk measures all exhibited clear differences between senior and subordinated bonds in the baseline models, and so should serve well to tell us whether there are similar differences between senior bail-in and senior non-bail-in bonds. We restrict our sample to senior bonds. As above, we present separate models for UK, core European and periphery European banks.

Table 7 below shows the results. We show only the coefficients of interest from Equations (3) and (4): β (the base effect of RISK), φ_1 (additional effect of CRISIS period dummy on RISK), φ_2 (additional effect of BRRD period dummy on RISK), φ_3 (linear effect of MREL dummy), and φ_4 (interaction of MREL dummy with BRRD dummy and RISK). φ_3 in the level

[8] Note that as fixed effects are set at the level of the bank, rather than the bonds, the model will capture cross-sectional differences between MREL and non-MREL bonds for a given bank.

equation and φ_4 in the risk sensitivity equation tell us whether bail-in bonds have a higher or a more risk sensitive spread respectively. The results show that MREL bonds have a 45bps higher spread than non-MREL senior bonds (φ_3), across all banks in the sample. MREL bonds are also more risk sensitive in terms the PD and the IG index than non-MREL bonds, though the risk sensitivity to the issue rating is not statistically significant. To give an idea of the economic significance, a one percentage point increase in the PD would increase spreads by 24bps more for bail-in bonds (φ_4) than for other bonds for which the impact would be 13bps ($\beta + \varphi_2$). The risk sensitivity to the index (φ_4) is 43bps greater for bail-in bonds, relative to a base effect of 42bps ($\beta + \varphi_2$).

The results differ slightly for UK and core European banks; while for core European banks all three risk measures suggest higher risk sensitivity of bail-in bonds, only the index suggests a similar effect for UK banks. Banks in peripheral European jurisdictions do not show evidence of a higher level or risk sensitivity of credit spreads for bail-in bonds. One interpretation is that bail-in is regarded as less credible in these jurisdictions. An alternative explanation is that for banks in these jurisdictions, the credit spread on the bonds issued by the relevant sovereign is a more important factor in driving the credit spreads of banks, and may be obscuring the influence of the bail-in mechanism.

Table 7: Comparison of bail-in and non-bail-in bonds

	All	UK	Core Europe	Periphery
Level				
φ3	44.6***	45.14***	46.17***	-2.87
Risk sensitivity - issue rating				
β	15.59***	-1.5	10.82**	23.05**
φ1	28.69***	27.5***	9.25***	33.4
φ2	-3.92**	0.2	1.51	27.17
φ3	8.24	4.91	-83.98**	186.05
φ4	2.14	6.16	13.84***	-25.82
Risk sensitivity - PD				
β	16.35**	-45.81***	19.82***	5.36
φ1	12.49	83.64***	-3.69	31.2**
φ2	-3.86	28.81***	12.36*	9.64
φ3	31.26***	36.31***	25.82***	-16.64
φ4	24.31**	17.29	31.47***	35.42
Risk sensitivity - index				
β	0.09	0.4***	0.43***	1.98***
φ1	0.36	0.69***	0.35***	0.1
φ2	0.32	0.18*	-0.01	-0.58**
φ3	-11.26	-23.32	-37.11***	20.11
φ4	0.43***	0.46**	0.72***	-0.2

Notes: *** indicates statistically significance at 1% level, ** at 5% and * at 10%. Standard errors are shown in brackets. The table shows our equations (3) and (4) estimated over the period Q1 2010-Q1 2019. Estimation was performed by OLS with standard errors clustered at the bank level. Bank effects (a dummy for each bank) and time fixed effects (year-month dummy variables) were also included.

d) Does a bank's progress in issuing bail-in bonds affect the risk sensitivity of bail-in bond spreads?

In this section we test whether a bank's progress in issuing bail-in bonds is associated with an increase in the level or risk sensitivity of the banks' bonds. The results in the previous section show that bail-in bonds tend to have higher and more risk sensitive spreads than non-bail-in bonds. But it is possible that these could be driven by the subordination (either structurally or contractually) of these bonds to non-bail-in liabilities, which may increase the perceived risk of the former even without any change in the likelihood of bail-in. In order to test whether the observed effects are indeed driven by an increased likelihood of bail-in, we test whether progress in issuing bail-in bonds changes investors' perception of the likelihood of bail-in.

In theory, increasing the size of a subordinated tranche should reduce the spread and risk sensitivity of bonds within that tranche, as the losses would be spread more thinly. Black and Cox (1976) showed that subordinating part of a firm's debt results in higher credit spreads for the subordinated debt than for the non-subordinated portion. As the size of the subordinated tranche increases, the spreads on both tranches fall since the losses are spread over a wider subordinated tranche and are less likely to reach the senior bondholders. This suggests that the size of the tranche of the bail-in bonds is likely to be a relevant factor, with a wider tranche driving lower spreads. According to this hypothesis, progress in issuing bail-in bonds would be negatively related to the level and risk sensitivity of bail-in bonds.

An alternative view is that progress in issuing bail-in bonds indicates a greater likelihood that the tranche could be bailed-in, so progress would be positively related to the level and risk sensitivity of bail-in bonds. Although resolution authorities may have the power to bail-in a wide variety of liabilities not limited to bail-in bonds and other MREL liabilities, there are several reasons why greater progress in issuing the bail-in bonds may be related to the likelihood of bail-in. First, progress in issuing bail-in bonds may make it more likely that the resolution authority would bail in that tranche. This could be, for example, because there is some fixed cost of bailing in the tranche (e.g. the risk of an adverse market reaction) which makes it undesirable to bail in the tranche for the sake of realising a small amount of loss absorbing capacity. Second, a faster rate of issuance may signal the resolution authority's willingness to bail in senior bonds to the market and the amount of pressure on the bank to increase the authorities' ability to bail-in senior bondholders. According to this view, progress in issuing bail-in bonds would be associated with a higher level and risk sensitivity of spreads (H3).

As a test of the hypothesis that progress in issuing bail-in debt increases risk sensitivity, we amend equations (3) and (4) to reflect the ratio of senior bail-in debt over risk-weighted assets ($PROGRESS_{jt}$). *PROGRESS* is a measure of a bank's progress in issuing senior bail-in bonds towards its MREL requirement, calculated as the total value of senior bail-in bonds issued across the bank, divided by the total risk-weighted assets. In the UK and certain other jurisdictions, this is the amount of qualifying HoldCo issuance (including regulatory capital and senior unsecured), whereas in other EA jurisdictions it is the amount of senior non-preferred debt plus regulatory capital. The average values of this *PROGRESS* variable were shown in Figure 3; UK banks were shown to have made the most progress, followed by core European banks and then periphery European banks.

We include a linear effect of *PROGRESS* (φ_5) and interaction terms capturing how *PROGRESS* affects the level (φ_6) and risk sensitivity (φ_7) of bail-in bonds. If issuance of explicitly bail-in debt is associated with higher level or risk sensitivity of spreads on bail-in bonds, then we would expect $\varphi_6 > 0$ and $\varphi_7 > 0$.

(5) $S_{ijt} = \alpha + \alpha_j + \tau_t + \gamma \times BOND_{it} + \delta \times BANK_{jt} + \eta \times MKT_t + \varphi_3 \times MREL_i + \varphi_5 \times PROGRESS_{jt} + \varphi_6 \times PROGRESS_{jt} \times MREL_i + \varepsilon_{ijt}$

(6) $S_{ijt} = \alpha + \alpha_j + \tau_t + \gamma \times BOND_{it} + \delta \times BANK_{jt} + \eta \times MKT_t + \beta \times RISK_{ijt} + \varphi_1 \times CRISIS_t \times RISK_{ijt} + \varphi_2 \times BRRD_t \times RISK_{ijt} + \varphi_3 \times MREL_i + \varphi_5 \times PROGRESS_{jt} + \varphi_4 \times MREL_i \times BRRD_t \times RISK_{ijt} + \varphi_7 \times PROGRESS_{jt} \times MREL_i \times BRRD_t \times RISK_{ijt} + \varepsilon_{ijt}$

The results are shown in Table 8. Overall we find that the level and risk sensitivity of spreads on bail-in bonds are increasing in *PROGRESS*. Each one percentage point increase in *PROGRESS* increases the bail-in bond premium by around 5bps on average (φ_6). The sensitivity of spreads to the probability of default is also increasing in *PROGRESS* (φ_7); for each one percentage point increase in *PROGRESS*, the impact on the spread of a one percentage point increase in the probability of default for bail-in bonds increases by around 4bps. The sensitivity to the index and the issue rating are not found to be significantly related to *PROGRESS* on average across all banks, although the rating is positive and significant for UK and core EA banks, and the index is positive and significant for core EA banks. For peripheral EA banks, PROGRESS has no significant effect on the level or risk sensitivity of spreads for the rating or index, although there is a strongly positive and significant relationship for the PD. This contrasts with the above results, without the PROGRESS variable, in which the risk sensitivity to PD was insignificant for peripheral EA banks. The fact that risk sensitivity becomes significant for PD when PROGRESS is taken into account may be interpreted as (weak) evidence that where bail-in bonds are not generally seen as more likely to be subject to bail-in, greater progress issuing bail-in bonds may increase investors' perception of the likelihood of bail-in.

We note that further research may be needed to conclusively show that greater progress issuing bail-in bonds causes a higher likelihood of bail-in. In particular our approach has not taken into account that banks may issue more bail-in bonds as a result of being perceived to have a higher likelihood of bail-in, for example because of regulatory pressure resulting from a higher risk profile. In this case the causality would run the opposite direction from our hypothesis; it is the risk sensitivity which is driving the decision to issue bail-in bonds, rather than the issuance of bail-in bonds driving higher risk sensitivity. This alternative view is consistent with the idea that the resolution regime has succeeded in increasing the perceived likelihood of bail-in, but it means the test we have performed is no conclusive as to exactly how this effect arises.

Table 8: How progress in issuing bail-in bonds affects the model coefficients

	All	UK	Core Europe	Periphery
Level				
φ_3	21.06***	28.86***	13.16**	-3.48
φ_5	2.42	0.52	1.29	-5.15
φ_6	4.61***	2.71***	6.59***	12.75
Risk sensitivity - issue rating				
β	13.3**	-1.08	5.41	31.84***
φ_1	25.39***	26.2***	11.15***	11.88
φ_2	-4.83**	-4.84	-2.14	21.23
φ_3	31.12**	20.79	90.98**	1.09
φ_5	-2.87	-4.72***	-17.67***	67.45
φ_4	-1.87	3.1	0***	-3.57
φ_7	0.85	1.06***	2.85***	-6.53
Risk sensitivity - PD				
β	13.32*	-41.28**	22.59**	4.55
φ_1	14.09*	76.56***	-3.67	26.24
φ_2	-19.96**	41.14*	-8.95	7.34
φ_3	33.32***	32.78***	28.48***	-0.87
φ_5	2.58	-1.82	-0.38	-7.64
φ_4	4.06	-0.89	11.64	-62.72***
φ_7	3.9***	2.01	2.7	72.14**
Risk sensitivity - index				
β	0.28	0.36**	0.44***	1.92***
φ_1	0.39	0.77***	0.36***	0.18
φ_2	0.28	0.25*	-0.1	-0.43***
φ_3	-5.25	-29.24	-11.73	20.35
φ_5	1.15	2.76	-8.36***	13.89
φ_4	0.23**	0.4**	0.28**	-0.24
φ_7	0.03	0	0.1***	-0.03

Notes: *** indicates statistically significance at 1% level, ** at 5% and * at 10%. Standard errors are shown in brackets. The table shows our baseline model (1) estimated for all banks and bonds over the period Q1 2010- Q1 2019. Estimation was performed using OLS with standard errors clustered at the bank level. Bank effects (a dummy for each bank) and time fixed effects (year-month dummy variables) were also included.

e) G-SIBs vs. non G-SIBs

In this section we test whether our findings in terms of the increased level and risk sensitivity of bail-in bonds hold for both G-SIBs and non-G-SIBs. The Financial Stability

Board (FSB) designates certain banks as G-SIBs based on a methodology that takes into account size, cross-jurisdictional activity, interconnectedness, substitutes or financial institution infrastructure for the services they provide, and their complexity. 11 out of the 37 banks in our sample are designated G-SIBs by the FSB.[9] Since these banks are more systemically important, investors may view them as more likely to be rescued by the authorities rather than investors being subjected to bail-in. If true, we would expect this to dampen our results in terms of the higher level and risk sensitivity of credit spreads on bail-in bonds versus non-bail-in bonds for these banks.

We assess this using modified versions of equations (3) and (4):

(7) $S_{ijt} = \alpha + \alpha_j + \tau_t + \gamma \times BOND_{it} + \delta \times BANK_{jt} + \eta \times MKT_t + \varphi_3 \times MREL_i + \varphi_8 \times GSIB_j + \varphi_9 \times GSIB_j \times MREL_i + \varepsilon_{ijt}$

(8) $S_{ijt} = \alpha + \alpha_j + \tau_t + \gamma \times BOND_{it} + \delta \times BANK_{jt} + \eta \times MKT_t + \beta \times RISK_{ijt} + \varphi_1 \times CRISIS_t \times RISK_{ijt} + \varphi_2 \times BRRD_t \times RISK_{ijt} + \varphi_3 \times MREL_i + \varphi_8 \times GSIB_j + \varphi_4 \times MREL_i \times BRRD_t \times RISK_{ijt} + \varphi_{10} \times GSIB_j \times BRRD_t \times RISK_{ijt} + \varphi_{11} \times GSIB_j \times MREL_i \times BRRD_t \times RISK_{ijt} + \varepsilon_{ijt}$

GSIB is a dummy variable taking the value 1 if a bank is a G-SIB and 0 otherwise. In the level equation (7), we introduce a linear effect of *GSIB* (φ_8) and an interaction with MREL (φ_9). A significant φ_9 indicates whether the bail-in bond premium is higher or lower for G-SIBs relative to non-G-SIBs. In the risk sensitivity equation (8), we introduce *GSIB* as a linear effect (φ_8), an interaction of *GSIB* with RISK (φ_{10}), and also an interaction of *GSIB*, *RISK* and *MREL* (φ_{11}). A negative and significant φ_{10} would indicate that G-SIBs' bonds (bail-in and non-bail-in) are generally less risk sensitive than non-G-SIBs' bonds, whereas a negative and significant φ_{11} would indicate that bail-in bonds are less risk sensitive for G-SIBs relative to bail-in bonds of non-G-SIBs.

The results are shown in table 10 below. G-SIBs' bonds are generally found to have a higher spread than those of non-G-SIBs (φ_8), but the bail-in bond premium is not significantly different between G-SIBs and non-G-SIBs (φ_9). There are no differences in risk sensitivity between G-SIBs and non-G-SIBs (φ_{10}), or between G-SIB's bail-in bonds and non-G-SIB's bail-in bonds (φ_{11}). This supports the conclusions of Pablos Nuevo (2019), who found a convergence between the yield spreads of G-SIBs and non-G-SIBs which she attributed to a reduction in perception of the "too big to fail" implicit guarantee.

[9] See https://www.fsb.org/work-of-the-fsb/policy-development/addressing-sifis/global-systemically-important-financial-institutions-g-sifis/. The G-SIBs in our sample (based on the FSB's 2019 exercise) are HSBC, Barclays, Deutsche, Credit Agricole, BPCE, ING, Santander, Societe Generale, Standard Chartered, BNP Paribas and Unicredit.

Table 9: How model coefficients differ for G-SIBs vs. non-G-SIBs

All banks					
			Risk sensitivity		
	Level		***Issue rating***	***PD***	***Index***
φ_3	32.1***	**β**	16.49*	21.23**	0.02
φ_8	85.84***	**φ_1**	29.91***	14.84	0.44*
φ_9	16.14	**φ_2**	-3.78**	-5.2	0.34
		φ_3	-3.44	31.12***	-13.69
		φ_8	60.54	-150.84***	81.06***
		φ_4	2.28	16.36	0.36**
		φ_{10}	-1.98	-5.64	0.05
		φ_{11}	1.9	10.01	0.11

Notes: *** indicates statistically significance at 1% level, ** at 5% and * at 10%. Standard errors are shown in brackets. The table shows our baseline model (1) estimated for all banks and bonds over the period Q1 2010- Q1 2019. Estimation was performed by OLS with standard errors clustered at the bank level. Bank effects (a dummy for each bank) and time fixed effects (year-month dummy variables) were also included.

f) The effect of issuing bail-in bonds from the holding company vs the operating company

As explained above, there are two approaches to issuing senior bail-in bonds: issuing these from the holding company (HoldCo) so that they are structurally subordinated to operating liabilities, or issuing bonds from the operating company that are contractually or statutorily subordinated to operating liabilities, known as 'non-preferred senior' (NPS) bonds. In light of our results above, this raises the question of whether the effects in terms of the spreads on bail-in bonds differ between HoldCo and NPS approaches. We amend equations (3) and (4) to the following:

(9) $S_{ijt} = \alpha + \alpha_j + \tau_t + \gamma \times BOND_{it} + \delta \times BANK_{jt} + \eta \times MKT_t + \varphi_3 \times MREL_i + \varphi_8 \times HOLDCO_j + \varphi_9 \times HOLDCO_j \times MREL_i + \varepsilon_{ijt}$

(10) $S_{ijt} = \alpha + \alpha_j + \tau_t + \gamma \times BOND_{it} + \delta \times BANK_{jt} + \eta \times MKT_t + \beta \times RISK_{ijt} + \varphi_1 \times CRISIS_t \times RISK_{ijt} + \varphi_2 \times BRRD_t \times RISK_{ijt} + \varphi_3 \times MREL_i + \varphi_8 \times HOLDCO_j + \varphi_4 \times MREL_i \times BRRD_t \times RISK_{ijt} + \varphi_{10} \times HOLDCO_j \times BRRD_t \times RISK_{ijt} + \varphi_{11} \times HOLDCO_j \times MREL_i \times BRRD_t \times RISK_{ijt} + \varepsilon_{ijt}$

Here *HOLDCO* is a dummy variable indicating whether a bank follows the HoldCo approach, rather than NPS. In the level equation (9), we introduce a linear effect of *HOLDCO* (φ_8) and an interaction with MREL (φ_9). A significant φ_9 indicates whether the bail-in bond premium is higher or lower for HoldCo bonds relative to NPS bonds. In the risk sensitivity equation (10), we introduce *HOLDCO* as a linear effect (φ_8), an interaction of *HOLDCO* with *RISK* (φ_{10}), and also an interaction of *HOLDCO*, *RISK* and *MREL* (φ_{11}). A significant φ_{11} would indicate whether the additional risk sensitivity of bail-in bonds relative to non-bail-in bonds is higher or lower for HoldCo bonds.

The results are shown in Table 9 below. Neither the level effect nor the risk sensitivity effect is significantly different for HoldCo bonds relative to NPS bonds. The only exception is for the PD, where a weakly significant φ_{11} indicates that the additional sensitivity of bail-in bonds to the PD, relative to non-bail-in bonds, may be somewhat weaker for the HoldCo approach.

Table 10: How issuance from the holding company affects the model coefficients

All banks					
			Risk sensitivity		
	Level		***Issue rating***	***PD***	***Index***
φ_3	47.93***	β	18.06***	8.2	0.41
φ_8	-17.33	φ_1	26.62***	4.71	-0.36
φ_9	-7.32	φ_2	-4.11***	2.79	0.23
		φ_3	-4.58	29.22***	-33.83**
		φ_8	22.38	119.06***	-16.66
		φ_4	3.84	39.5***	0.68***
		φ_{10}	-12.86*	-13.97	-0.22
		φ_{11}	2.02	-24.67*	-0.14

Notes: *** indicates statistically significance at 1% level, ** at 5% and * at 10%. Standard errors are shown in brackets. The table shows our baseline model (1) estimated for all banks and bonds over the period Q1 2010- Q1 2019. Estimation was performed by OLS with standard errors clustered at the bank level. Bank effects (a dummy for each bank) and time fixed effects (year-month dummy variables) were also included.

g) Robustness check: bank-time effects

A robustness check is performed to ensure that the differences we have found between bail-in and non-bail-in bonds are driven by the characteristics of the bonds, and not by other factors such as changes in a bank's business model or risk profile. The comparison between bail-in and non-bail in bonds (i.e. equations 3 and 4) is repeated with the addition of a full set of bank- and month-specific effects (i.e. a separate set of monthly time effects specific to every bank). Bank effects and monthly time effects are included as before. This is possible due to the multi-level panel nature of the dataset, as there are multiple bonds per bank. The inclusion of bank- and time-specific effects removes any time-varying variation between banks, so that the results for our model coefficients are purely driven by differences between bonds within banks. This means the conclusions are not affected by factors such as changes in banks' strategies or risk profiles, or risks that affect some banks more than others (e.g. Brexit risk).

The results, presented in Table 11, support our earlier findings. Overall the results support our conclusions. A positive MREL premium (φ_3) of a similar magnitude is observed, and this is significant for the UK and core Europe as before. We also find evidence of significantly higher risk sensitivity of MREL bonds (φ_4) for the PD and the index. Risk sensitivity is also found to be greater for MREL bonds using the issue rating as before, but in this version of the model the coefficients are not statistically significant. The risk sensitivity of non-MREL bonds is not significantly different from the pre-bail-in period (φ_2), consistent with the hypothesis that the higher risk sensitivity of bail-in bonds is being driven by a higher likelihood that they will be bailed in.

Table 11: Robustness check with bank-time effects

	All	**UK**	**Core Europe**	**Periphery**
Level				
φ3	42.5***	47.41***	39.44***	39.52
Risk sensitivity - issue rating				
β	12.69***	9.61***	1.59	28.95***
φ1	1.42	2.59	-7.5	-8.82
φ2	18.25	-1.16	19.48**	29.36
φ3	-11.35	3.5	-11.8	-126.64
φ4	0.26	4.16	1.7	13.73
Risk sensitivity - PD				
β	1.86	-5.4	-1.69	7.54
φ1	8.33*	27.01*	5.92**	25.2**
φ2	-3.78	-5.42	3.28	-12.63
φ3	32.87***	37.59***	25.81***	15.96
φ4	21.3***	28.94	24.52***	27.82
Risk sensitivity - index				
β	0.61***	0.42***	0.43***	1.9***
φ1	0.54***	0.71***	0.37***	0.44
φ2	0.02	0.06	0.03	-0.68***
φ3	-21.89**	-60.08***	-27.46***	-66.76**
φ4	0.49***	0.72***	0.57***	0.92**

Notes: *** indicates statistically significance at 1% level, ** at 5% and * at 10%. Standard errors are shown in brackets. The table shows our baseline model (1) estimated for all banks and bonds over the period Q1 2010- Q1 2019. Estimation was performed by OLS, with standard errors clustered at the bank level. Bank effects (a dummy for each bank), time fixed effects (year-month dummy variables) and bank-time effects (dummy variable for each bank at each year-month) were also included.

5. Conclusions

We have assessed the impact of the new bank resolution framework which was introduced in the EU in 2015, after the euro area sovereign debt crisis. This aimed to reduce the extent to which governments are compelled to provide support to distressed banks, by facilitating the orderly resolution of distressed banks including subjecting private investors to losses (or 'bail-in') in the event of a resolution. We have provided evidence that there has been an increase in investors' perceived likelihood of being bailed in. More specifically, we find that both the level and risk sensitivity of credit spreads have risen following the introduction of the new framework, from 2015 onwards. The increase in risk sensitivity is found for various measures of risk, including the risk of specific bonds (the issue rating), the risk of the issuer (the probability of default), and broader corporate credit conditions (proxied by an investment-grade credit index).

We have sought to strengthen the evidence for a link between the new resolution framework and the increased level and risk sensitivity of spreads, by exploiting the fact that, in the last few years, a new class of senior bonds has emerged which is explicitly earmarked for bail-in. These bail-in bonds are subordinated to other senior bonds, either by law, by the terms of the bond, or by being issued from the holding company rather than the operating company. This facilitates the bail-in of these bonds without imposing losses on other senior creditors for which bail-in is less useful or desirable, such as depositors and derivative liability holders. If the increase in the level and risk sensitivity of senior bonds is due to the new bail-in framework, then we should observe that the effects are particularly strong for the new bail-in bonds given these are explicitly earmarked for bail-in. Comparing across banks that have both bail-in and non-bail-in bonds, we show that the spreads are higher and more risk sensitive than those of non-bail-in bonds. The higher risk sensitivity of bail-in bonds is observed for issue- and issuer-specific measures of risk, as well as for broader credit conditions.

The difference between bail-in and non-bail-in bonds is similar for both UK and euro area banks. We also show that the effects are similar for the two types of senior bail-in bonds, non-preferred senior bonds (which are statutorily or contractually subordinated) and bonds which are issued from the HoldCo. We show that the increased level and risk sensitivity of spreads on bail-in bonds are not significantly different between banks deemed to be systemically important (G-SIBs) and non-G-SIBs. Finally, we show that the level and risk sensitivity of bail-in bonds are increasing based on the bank's progress in issuing bail-in bonds. This provides further support for the idea that our results are driven by the new resolution regime, since having a greater tranche of bail-in bonds makes it more straightforward for resolution authorities to impose losses on creditors in the event of a resolution.

Overall our results support policymakers' approach, in the post-crisis period, of seeking to reduce banks' reliance on implicit support from governments in the event that those banks experience distress. We show that the new regime is credible, as it has increased investors' perception of the likelihood that they will be bailed in.

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Annex: PROGRESS variable by bank, averaged for each year

Bank	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
UK banks										
Barclays	0.0%	0.0%	0.0%	0.0%	0.1%	0.9%	2.7%	5.1%	7.2%	8.4%
CYBG	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%	2.2%
HSBC	0.1%	0.2%	0.4%	0.5%	0.4%	0.4%	2.0%	4.3%	5.9%	7.0%
LBG	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	2.3%	6.1%	7.5%
Nationwide	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	9.9%	14.9%
RBS	0.2%	0.2%	0.2%	0.2%	0.3%	0.4%	1.4%	3.4%	6.1%	8.3%
San UK	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	2.6%	5.0%	7.8%	9.5%
StanChart	0.0%	0.0%	0.5%	1.2%	1.8%	2.8%	5.2%	6.7%	7.5%	8.3%
Core European banks										
ABN	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
BNP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	3.3%	5.1%
BPCE	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	3.8%	5.4%
Banque Postale	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	1.4%
Commerzbank	0.1%	0.4%	0.4%	0.4%	0.4%	0.6%	1.0%	1.5%	1.2%	1.0%
CredAg	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	3.5%	4.0%
Danske	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	7.9%
Deutsche	1.8%	1.5%	1.2%	2.0%	2.5%	3.2%	5.1%	8.3%	10.5%	10.4%
Erste	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Handelsbanken	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
ING	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	2.6%	5.9%
KBC	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	3.0%	3.4%	3.9%
LBBW	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.3%	3.9%	2.7%
Nordea	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	1.3%
NyKredit	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%
Rabobank	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	1.7%
SEB	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SocGen	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	2.4%	4.5%
Swedbank	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Periphery European banks										
AIB	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	4.2%
BBVA	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.9%	1.2%
BOI	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	1.4%
Bankia	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Caixabank	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.9%	2.1%
Intesa	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Sabadell	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Santander	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	1.4%	1.6%
Unicredit	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	4.0%