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Bail-in and Bank Funding Costs[*]

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Abstract

We empirically evaluate the impact of the new resolution policy, the so-called Bank Recovery and Resolution Directive (BRRD) enacted in 2016, on the cost of funding for EU banks. We first measure the change in the spreads of credit default swaps on subordinated and senior bonds issued by EU banks around the period when the policy became effective and provide evidence of a greater increase in the risk premia of more junior bail-in-able bonds than for senior bonds. We then investigate the reasons for the different intensities by which this policy has affected the banks in our sample. We uncover specific characteristics of banks and macroeconomic factors to explain this heterogeneity. Banks with more problematic loans, that are less capitalized, and that are headquartered in countries with a higher risk premium on sovereign debt have experienced a greater rise in the cost of their funds; conversely, larger banks with a greater proportion of domestic over total subsidiaries were less affected. Moreover, we show that the low-interest-rate environment has increased the riskiness of all the banks in our sample. Overall, our paper provides evidence that market discipline has been reinforced by the adoption of the BRRD.

JEL Classification: G28; G21; G14.

Keywords: Bank resolution; Credit Default Swaps; Market discipline.

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1 Introduction

In April 2014, the European Parliament approved the Bank Recovery and Resolution Directive (BRRD) and all Member States had to transpose it into their respective national laws by the end of the same year. The new rules have applied since January 2015, except for the Single Resolution Mechanism, which was only implemented in all countries in January 2016, establishing a new framework to resolve banks distress. This directive is part of a new set of regulations developed after the global financial crisis of 2007-08 to avoid disruption in the system of payments, to increase market discipline by bank creditors, to avoid moral hazard by bankers, to limit the use of public money when rescuing private banks, and, in general, to increase the resilience of the financial system.

Following the financial crisis, many private banks were on the verge of bankruptcy. Governments had to intervene to rescue several institutions (e.g., Monte dei Paschi di Siena, Dexia, Hypo Alpe, among others) to prevent even greater disruption to the real economy. When a bank fails, the real economy is affected by a contraction in credit supply and the disruption of existing credit relationships. In addition, when a bank is in distress, other financial institutions may also be affected if they are interconnected with the weak bank, due to the spreading of the contagion through their balance sheets. The remedy since immediately after the financial crisis has been to use public money to rescue banks in distress. In the period 2008-2012, public intervention amounted to around 600 billion euro, which corresponds to 4.60% of gross domestic product in Europe in 2012 (see Benczur et al., 2017).

This has generated public outcry around the world, as public money has been used to relieve shareholders and bondholders from the losses caused by the mismanagement of their banks. In addition, public authorities began to fear a surge in moral hazard by bank managers. In some European countries, there was a further risk of being trapped in a vicious circle (the so-called "doom loop"), by which the largest banks could not be rescued given the already high level of public debt, while, at the same time, injection of public money to prevent banks from failing required new issues of public bonds (see Farhi and Tirole, 2018).

The BRRD provides national authorities with effective rules for dealing with failing banks to ensure an ordered resolution, to preserve the continuity of banks' critical functions, and to maintain financial stability, while minimizing the cost to taxpayers. More specifically, it requires all shareholders and creditors (holding bail-in-able bonds) to bear at least 8% of the losses of the bank's total liabilities before calling for government intervention. The bail-in tool allows banks to recapitalize by converting (or writing down) debt owned by private creditors into equity. Debt subject to bail-in is commonly referred to as bail-in-able debt and it includes different categories of junior debt, such as unsecured, uninsured, and subordinated bonds. By reducing the possibility of rescuing failing banks through the use of public money, the bank's default risk is transferred from taxpayers to investors who then face a higher credit risk and, consequently, demand a higher risk premium. This mechanism stimulates a more accurate evaluation of bank risk leading to a repricing of bail-in-able debt and, thus, to an increase in the cost of funding for banks.

The first objective of this paper is to measure the impact of the new resolution policy on the cost of funding for EU banks. We measure the change in the price of bail-in-able debt due to the new regulation by applying an event-study approach to the spreads of credit default swaps (CDS) issued by a sample of 38 EU banks in the period of implementation of the BRRD (January-February 2016). We find positive and statistically significant abnormal returns for almost all the banks in our sample, confirming that the adoption of the BRRD contributed to an increase in funding costs for EU banks.

In the second part of this study, we measure the intensity of this effect across the banks in our sample to disentangle banks' intrinsic vulnerability from macroeconomic factors. We regress the abnormal returns derived in the first part of our analysis on bank-specific and macroeconomic variables within a fixed-effect model (alternatively a pooled regression). The results show that macroeconomic conditions, such as financial market volatility and the level of the monetary policy risk-free rate, together with bank-specific and country-specific characteristics, affected the cost of funding. On the one hand, banks with lower solvency ratios, a higher proportion of problematic loans, or headquartered in countries with a greater risk of default on their sovereign debt have been more affected by the introduction of the BRRD. On the other hand, larger banks with a higher concentration of domestic subsidiaries were more protected by the changes in regulation. Furthermore, we show that the low-interest-rate environment (LIRE) increased the riskiness of all the banks in our sample.

After discussing the relationship with the literature, in Section 3 we present an event study to test the impact of the BRRD on the spreads of CDS on either bail-in-able and non-bail-in-able debt. In Section 4 applying a cross-sectional analysis on the panel of EU banks over the sample period, we explain the different intensity in the rise of bank funding costs, by selecting the significant factors among different characteristics of banks and of the macroeconomic environment in which they operate. Finally Section 5 concludes the paper.

2 Related literature

Our paper speaks to several strands of the literature.

First, it is related to the empirical evidence on market discipline by creditors (see for instance Flannery and Sorescu, 1996 and Sironi, 2003 among others). Several papers have tested the impact of the BRRD on market discipline (among others Cutura, 2018; Lewrick et al., 2019; Crespi et al., 2019; Giuliana, 2019; Schafer et al., 2016; Fiordelisi et al., 2020). Using a difference-in-difference approach on European banks Cutura (2018) finds evidence of a bail-in risk premium of 10-15 bps on unsecured bonds maturing in 2016 relatively to the one maturing before 1/01/2016. Similar evidence is found by Lewrick et al. (2019)

on the price differential between senior bail-in bonds and comparable senior bonds that are issued by the same banking group but are not subject to bail-in risk: they find an average bail-in risk premium of 20 bps for the global sample, while around 30 bps for the UK and European banks only. For the Italian market, Crespi et al. (2019) study the spread on the primary market, finding a rise in the spread between bail-in-able and senior bonds in the period 2013-2016. Other papers have tested the credibility of this resolution mechanism according to investors' expectations. Giuliana (2019) shows that in specific cases (such as Banca di Cipro (2013), Banco Espirito Santo (2014), SNS Reaal, Bankia (2012) among others) there is evidence of a change in the price of bonds to incorporate the greater default risk. A similar conclusion is reached by Schafer et al. (2016) who found an increase in the CDS spread and a fall in the stock price for the same bail-in episodes (except for Bankia). Negative abnormal stock price reactions to bail-in policy announcements were also found by Fiordelisi et al. (2020), showing that investors perceive the new bail-in as a credible change of regime. All these papers provide evidence of an increase in market discipline following the implementation of the BRRD. In the first part of our analysis, we apply an event study methodology to test the impact of the new resolution on the CDS spreads issued by EU banks and find similar evidence. Moreover, we show that the reaction is stronger for CDS on bail-in-able bonds compared to CDS on more senior bonds. From the point of view of banks, this evidence implies an increase in their funding costs. In the years preceding the global financial crisis EU banks have relied on bonds as a source of their liquidity (see ECB (2009)). If the price of those bonds rises, to compensate for the expected losses in case of default, the EU banks become more fragile and exposed to market risk.

In the second part of this paper, we study the factors behind the reaction of the returns of bail-in-able bonds according to the different characteristics of EU banks. Several papers have studied the relation between funding costs and banks' characteristics (see among others Babihuga and Spaltro, 2014; Santos and Bonfim, 2005; Arnould et al., 2020; Aymanns et al., 2016; Dent et al., 2021; Schmitz et al., 2017). Babihuga and Spaltro (2014) find on a sample of banks operating between 2001 and 2012 that the changes in the cost of unsecured bonds are related to the solvency ratio of the issuing bank. Although in the short-run an increase in capital leads to an increase in funding costs, due to adverse selection (as suggested by Myers and Majluf, 1984), in the long run, the effect is beneficial (fall in funding costs). Along the same lines, Santos and Bonfim (2005) show that the differences in funding costs across banks are given by the quality of their asset side, capital ratio, liquidity, solvency, and profitability. They find a negative relation between solvency, liquidity, and bond spreads due to the greater ability of capitalized banks to absorb unexpected losses; as for the leverage they find a statistically non-significant association. Indeed leverage is a measure of the risk of default (see for instance Hasan et al., 2016 and Annaert et al., 2013). Other papers have tested the relation between solvency and funding costs (Arnould et al., 2020; Aymanns et al., 2016; Dent et al., 2021, and Schmitz et al., 2017; Gambacorta and Shin, 2018) finding that greater capitalization reduces the cost of funding for banks. Gambacorta and Shin (2018) provide evidence that more capitalized banks, by facing lower funding costs are also more prone to expand their lending in response to monetary policy: they uncover a positive relation between solvency and availability of credit in the economy where the driver is the lower funding cost for banks.

Also, macroeconomic factors are important drivers of funding costs in banks. Among the macro factors, the literature acknowledges GDP growth, sovereign risk, and financial market volatility. The GDP growth captures the trend in the real economy which explains banks' profitability: the more profitable banks are, the greater their ability to recover from losses and the lower the risk premium (see for instance Babihuga and Spaltro, 2014; Santos and Bonfim, 2005 and Pablos Nuevo, 2020). On the other hand the higher the sovereign risk the higher the default risk of banks as there is the shortage of public money to resolve a bank in distress (as in Arnould et al., 2020; Babihuga and Spaltro, 2014 and Acharya et al., 2014). Greater volatility in financial markets signals greater risk aversion by investors who then require higher risk premia for their investments, also on bank debt (as in Hasan et al., 2016; Pablos Nuevo, 2020 and Arnould et al., 2020). Finally, another important macroeconomic variable is the risk-free interest rate which has a direct impact on the cost of funds for banks as alternative opportunity costs for investors (see Babihuga and Spaltro, 2014; Santos and Bonfim, 2005; Arnould et al., 2020).

In the second part of our paper, we explain the heterogeneity in the reaction of funding costs after the adoption of the BRRD with either bank-specific variables (such as the solvency ratio, liquidity, asset quality, and profitability) and macroeconomic variables. The novelty in this paper is in explaining the different intensities by which bank funding costs have reacted to the adoption of the new resolution policy to these bank-specific and macro factors.

Finally, the paper provides support to the scant theoretical literature linking the cost of funding of banks to the resolution regime. In particular, we refer to Cerasi and Montoli (2020), Walter and White (2020), and Pandolfi (2021). All these papers show, within different theoretical models where bank funding costs are endogenous, why a switch from bail-out to bail-in will increase the cost of uninsured bonds for banks.

3 Impact on funding costs: an event-study

The event-study methodology enables the researcher to measure the presence of abnormal returns when news about a specific event is disclosed to the public (see, for instance, the chapter on the methodology of event studies by Campbell et al., 1997).

To measure the impact of the BRRD, the new resolution policy enacted in January 2016, on bank funding costs, we search for evidence of a reaction by bank creditors. In particular, we compare the risk of subordinated and senior bonds before and after the implementation of the BRRD, since the resolution mechanism specifically affects junior bail-in-able debt.

To this aim, we used SNL Financial to retrieve daily single-name CDS spreads with a one-year maturity of subordinated and senior bonds for 38 EU banks (see the list of banks in our sample in Table 2 in the appendix) in the period between March 2015 and February 2016. We have chosen CDS spreads over the price of bonds as a proxy for the marginal cost of funding, since bonds are more heterogeneous in terms of their characteristics (such as volumes, currency in which they are denominated, maturity, and face value) compared to CDS, and this may lead to several types of bias in time series analysis.

The event window is set on the first 10 trading days of February 2016 and, consequently, the estimation window includes the 10 previous months, so that more than 200 trading days are taken into account. In the first part of the analysis, we have chosen a dummy approach, meaning that a linear regression model is implemented with CDS spreads as a dependent variable, while including a dummy assuming a value of one only in the event window among the covariates; the dummy coefficient is the abnormal return of funding costs. In addition, we have included a market index among the covariates, the EURO STOXX Banks Index: this index provides the common trends in the stock price for a representative selection of listed banks in the Eurozone, covering 22 institutions from eight Eurozone countries: Austria, Belgium, France, Germany, Ireland, Italy, the Netherlands, and Spain.

To measure the impact on the cost of junior debt we regressed the daily CDS spreads on junior bonds, according to the following equation:

$$CDS\ SUB_{it} = \alpha_i + \beta_i D_t + \gamma_i EURO\ STOXX_t + \epsilon_{it} \tag{1}$$

For this specification, the coefficient of greatest interest for our analysis is β_i denoting the abnormal return of CDS spreads for bank i. In other words, the coefficient represents the difference between the estimated value of the CDS spread in the previous 10 months and the observed value in the time window including the event. The results provided in Table 3 show that the CDS spread of subordinated bonds increased following the introduction of the BRRD by a significant amount. A positive coefficient implies that the BRRD has increased the spread of CDS on subordinated debt capturing a greater risk premium. From the point of view of the EU banks, this implies a rise in the cost of attracting funds from subordinated bondholders.

We have applied the same methodology on the differential between the CDS spread on subordinated and senior bonds to capture the differences in the reaction of junior bail-in-able and senior bonds. The estimated relation is given by the following equation:

$$CDS\ DIFF_{it} = \alpha_i + \beta_i D_t + \gamma_i EURO\ STOXX_t + \epsilon_{it} \tag{2}$$

As shown in Table 4, the abnormal returns (given by the coefficients β_i) are nearly all positive and strongly significant, with an average value of 36 bps (minimum -9.65 bps and maximum 141 bps) when excluding influent outliers (as can be seen from the second row of Table 5). This evidence demonstrates a statistically significant increase in junior debt returns relative to senior debt due to the new regulation. This result also shows that market discipline has increased as a consequence of the new resolution policy, since investors have started to correctly price the increase in risk of bail-in-able debt instruments.

To challenge our results, we perform also a placebo test. We regress the previous equations, (1) and (2), anticipating the dummy on the event window of December 2015. The results show that the coefficients on the redefined dummy are negative and statistically significant (a summary of the results are provided in Table 6 in the Appendix). This placebo test proves that the effect on the CDS of junior bonds is associated to the implementation of the BRRD and was not anticipated by investors.

So far our exercise provides evidence of a statistically significant impact of the BRRD, since its approval in December 2016, on bank funding costs, pointing to an increase in the risk premia of subordinated bonds.

4 Cross-sectional analysis

In this section, we further investigate the heterogeneity in the increase in the cost of funding for the EU banks in our sample, due to the implementation of the BRRD.

From eq.(2), we derive the residuals of the regression on the estimation window, which represent the estimated abnormal returns on funding costs. These abnormal returns are our dependent variable, for which heterogeneity is to be explained using bank characteristics and macro variables.

To include balance-sheet data as a proxy for bank-specific characteristics, we had to reduce the frequency of our observations, since accounting records are available only at a quarterly frequency. For this reason, the sample period is extended to Q4 2014 to Q1 2017 (10 quarters) and quarterly instead of daily average abnormal returns are used. Second, to proxy for solvency and performance of individual banks, we add bank-specific variables such as *Core Tier 1 ratio* and return on equity (ROE; following Pablos Nuevo, 2020). The logarithm of total assets represents bank size. We include the portion of problematic loans (both impaired and nonperforming) on the total of gross customer loans as a measure of asset quality[1]. We also had to reduce our sample from 38 to 26 banks since quarterly data were not available in our period of observation from SNL Financial.

To recover our dependent variable as residual of the event study presented in the previous section, we run the regression on the market model in eq.(2), leaving out the dummy variable, on the interval between 10/2014 and 01/2016. We then check that the estimated abnormal returns are statistically significant (using tests, such as those in Corrado, 1989; Corrado and

[1]As quarterly data are not available for the whole sample, we had to resort to semiannual (or annual) data for a subset of banks

Zivney, 1992; Pelagatti, 2013) and, finally, we include them in the cross-section model as a dependent variable after a transformation into quarterly averages.

Following Arnould et al. (2020), we added several macro variables as explanatory variables, such as the VSTOXX to account for financial market volatility and the Euro Over Night Index Average (EONIA) to capture risk-free rates and the monetary policy stance in the Euro area. Finally, to account for the risk of default on sovereign debt, we use the yield spreads between the 10-year sovereign bond for each EU country and the German 10-year Bund: we expect banks headquartered in countries with a higher level of public debt to face greater risk. The summary statistics of the explanatory variables are reported in Table 7.

To study the drivers of the abnormal increase in funding costs we use a fixed-effect model given by:

$$\begin{aligned} AR_{it} &= \alpha_i + \beta_1 Spread_{it} + \beta_2 EONIA_{t-1} + \beta_3 VSTOXX_t + \beta_4 log(TotalAssets)_{it-1} \\ &\quad + \beta_5 CoreTier1_{it-1} + \beta_6 ROE_{it} + \beta_7 ProblemLoans_{it-1} + \epsilon_{it}, \end{aligned} \tag{3}$$

where i denotes the bank and t the quarter. Notice that EONIA, Core Tier 1 ratio and Problematic Loans are lagged by one quarter to circumvent endogeneity problems. The results are in Table 8 (Columns (1) and (2)).

An alternative model is used to take into account a measure of the proportion of domestic over total subsidiaries for each bank[2]. Since this variable is time-invariant, the fixed-effects model is redundant and we run a pooled regression (see Table 8 columns (3) and (4) for results) according to:

$$\begin{aligned} AR_{it} &= \gamma + \beta_1 Spread_{it} + \beta_2 EONIA_{t-1} + \beta_3 VSTOXX_t + \beta_4 log(TotalAssets)_{it-1} \\ &+ \beta_5 CoreTier1_{it-1} + \beta_6 ROE_{it} + \beta_7 ProblemLoans_{it-1} + \beta_8 DomesticSubsidiaries_i + \varepsilon_{it}. \end{aligned} \tag{4}$$

Diagnostic tests on the joint significance of coefficients on individual fixed effects versus random effects and the absence of serial correlation and cross-sectional dependence indicate that all equations are well specified. The goodness of fit measured by R-squared is higher for the fixed-effect models, reaching the highest value (0.1829). Indeed, the estimated coefficient of *Problem loans* is significant in model (3) and positive. We conclude that banks with greater risk of bearing losses from nonperforming or impaired loans are more affected by the rise in funding costs. In addition, we observe a negative association between *Core Tier 1 ratio* and abnormal returns. This result provides support to the intuition that banks that are better-capitalized face a lower rise in funding costs (result also shared by other papers, such

[2]Data on domestic subsidiaries are retrieved from Orbis - Bank Focus using the information on each bank Geographic Footprint as of April 2021. Since time-series data are unavailable, we use recent data under the assumption that the number of subsidiaries did not change w.r.t. our sample period.

as Arnould et al., 2020; Aymanns et al., 2016; Dent et al., 2017; Santos et al., 2005; Schmitz et al., 2017); instead, the coefficient of ROE is not statistically significant, implying that the differences in the impact on funding costs are not explained by bank profitability. The coefficient associated to bank size is large and negative in eq.(3), while it decreases in model (4) and remains significant. This result can be explained by the inclusion of the share of domestic subsidiaries: since its coefficient is highly significant and incorporates the effect in column (3), larger banks are more protected by the consequences of the BRRD. This result is suggestive of the persistence of the "too big to fail" paradigm, that is, national champions face a lower risk of being bailed in.

All macro variables enter regression (3) with statistically significant coefficients. The positive and statistically significant coefficient of *Sovereign spread* provides evidence of the existence of the "doom loop" (see, for instance, Farhi and Tirole, 2018), where a highly indebted country offers a weaker safety net for a large bank headquartered in that country. Hence a bank in distress requiring an injection of liquidity has a higher perceived risk of bankruptcy when located in a country with a large public debt (see Arnould et al., 2020; Babihuga and Spaltro, 2014).

Also, a positive and statistically significant coefficient for the volatility index signals that greater stress in financial markets and uncertainty from investors are reflected in a greater impact of the BRRD on the cost of funding. This could be due to greater volatility impacting the resilience of the banking system, due to the perceived greater systemic risk, which translates into a greater risk premium demanded by junior bondholders. This result is in line with previous studies (see, for instance, Annaert et al., 2013; Hasan et al., 2016; Pablos Nuevo, 2020; Arnould et al., 2020, among others).

The coefficient on EONIA is negative and statistically significant. Notice that the index is negative over the entire sample (with an average value of -0.17), which explains the negative correlation between the EONIA and bank funding costs. This result could be explained through the risk-taking channel effect of monetary policy on financial institutions and the LIRE. It has been demonstrated that a long period of exceptionally low interest rates may induce banks to increase their propensity to take on more risk (see Altunbas et al., 2010; Maddaloni et al., 2008, among others). This correlation has been supported by different studies: Laeven et al. (2016) and Delis et al. (2012) find a negative relation between short-term interest rates and the risk borne by US banks; Karapetyan (2016) shows evidence that Norwegian banks operating with low interest rates (either overnight and in the interbank market) tend to supply loans to riskier firms; similar results are found for Spain by Jimenez et al. (2014) and for Bolivia by Ioannidou et al. (2015). Therefore, investors demand a higher risk premium.

5 Conclusions

In this paper, we have tested the impact of the implementation of the BRRD on EU banks' funding costs. On the one hand, we have documented a rise in bank funding costs due to the new resolution policy together with a measure of its intensity. On the other hand, we have analyzed the heterogeneity of this impact. By contributing to a more accurate evaluation of bank risk, i.e., improved market discipline, the implementation of the BRRD has reinforced financial stability in the EU. However, specific factors, such as lower capitalization, a larger amount of problematic loans, and higher sovereign risk, have exacerbated the rise in the cost of funding for the weakest banks, threatening further financial instability.

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6 Appendix

Table 1: The table reports the list of data sources for our sample.

Data	Source
Single name CDS spreads	SNL Financial
EUROSTOXX Banks	SNL Financial
Balance sheet data	SNL Financial
10-year sovereign bond yields	SNL Financial
VSTOXX	`https://www.stoxx.com/document/Indices/Current/HistoricalData/h_v2tx.txt`
EONIA	ECB - Statistical Data Warehouse
Domestic subsidiaries data	Orbis - Bank Focus

Table 2: The table reports the list of 38 EU banks included in our sample. Banks marked with $*$ are those used for the estimation of eq.(3) and (4).

Country	Symbol[a]	Bank
AT	ERSTBK*	Erste Group Bank
AT	RZB*	Raiffeisen Zentralbank
BE	DEXIA	Dexia
DE	BYLAN	Bayerische Landesbank
DE	CMZB*	Commerzbank
DE	DB*	Deutsche Bank
DE	WESTLB	Portigon
DE	HVB	Unicredit Bank
DK	DANBNK*	Danske Bank
ES	BANSAB*	Banco Sabadell
ES	POPSM	Banco Popular Espanol
ES	SANTAN*	Santander
ES	BKTSM*	Bankinter
ES	BBVASM*	Banco Bilbao Vizcaya Argentaria
ES	CAIXAB*	Caixa D'estalvis I Pensions De Barcelona
ES	CAJAME	Caja Mediterraneo
FR	SOCGEN*	Societe Generale
FR	BFCM	Banque Federative du Credit Mutuel
FR	BNP*	BNP Paribas
FR	ACAFP*	Credit Agricole
FR	KNFP*	Natixis (subsidiary of Groupe BPCE)

GB	BACR*	Barclays
GB	HSBC*	Hongkong & Shanghai Banking Corp.
GB	LLOYDS*	Lloyds
IT	ISPIM*	Intesa Sanpaolo
IT	BACRED*	Mediobanca
IT	UCGIM*	UniCredit
IT	UBIIM*	UBI Banca
IT	MONTE	Monte dei Paschi di Siena
IT	BPIIM	Banco Popolare
NL	INTNED*	Ing Bank
NL	SNSBNK	SNS Bank
NL	RBSNV	RBS N.V.
NL	RABOBK	Rabobank
SE	SEB*	Skandinaviska Enskilda Banken
SE	SHBASS*	Svenska Handelsbanken
SE	NBHSS*	Nordea Bank
SE	SWEDA*	Swedbank

[a] Acronyms of each bank have been sourced from SNL Financial.

Table 3: This table reports the estimation results of the market return model in eq.(1). The sample comprises daily data for 38 EU banks (see Table 2) for the period 24/03/2015 - 12/02/2016. The estimation method is OLS. The dependent variable is the CDS spread of subordinated bank debt, the regressors are the EURO STOXX Index and a dummy variable that equals 1 in the first 10 trading days of February 2016 and 0 otherwise. The dummy coefficients are the estimated Abnormal Returns of the CDS spreads. Bank fixed-effects are included in the model. Multiple R^2 for each equation and p-values for each estimated coefficient are reported.

Bank		**Estimate**	**Pr(>|t|)**	**Signif**	**Multiple R^2**
ACAFP	Intercept	74.5248	0.0000	***	0.5969
	Event-Dummy	46.2171	0.0000	***	
	EURO STOXX	-0.4428	0.0000	***	
BACR	Intercept	68.2738	0.0000	***	0.6771
	Event-Dummy	78.3721	0.0000	***	
	EURO STOXX	-0.5727	0.0000	***	
BACRED	Intercept	167.7996	0.0000	***	0.7670
	Event-Dummy	168.6514	0.0000	***	
	EURO STOXX	-0.5908	0.0000	***	
BANSAB	Intercept	186.3593	0.0000	***	0.7347
	Event-Dummy	12.5354	0.0630	*	
	EURO STOXX	-2.2213	0.0000	***	

BBVASM	Intercept	138.5496	0.0000	***	0.8070
	Event-Dummy	54.8012	0.0000	***	
	EURO STOXX	-1.7975	0.0000	***	
BFCM	Intercept	100.3466	0.0000	***	0.6093
	Event-Dummy	38.0921	0.0000	***	
	EURO STOXX	-0.4342	0.0000	***	
BKTSM	Intercept	119.2788	0.0000	***	0.8419
	Event-Dummy	7.7906	0.0191	**	
	EURO STOXX	-1.5223	0.0000	***	
BNP	Intercept	67.0667	0.0000	***	0.7057
	Event-Dummy	51.3921	0.0000	***	
	EURO STOXX	-0.3116	0.0000	***	
BPIIM	Intercept	240.4269	0.0000	***	0.8592
	Event-Dummy	127.1385	0.0000	***	
	EURO STOXX	-5.4846	0.0000	***	
BYLAN	Intercept	117.7815	0.0000	***	0.5767
	Event-Dummy	35.2215	0.0000	***	
	EURO STOXX	-1.0780	0.0000	***	
CAIXAB	Intercept	126.9134	0.0000	***	0.7846
	Event-Dummy	15.0982	0.0004	***	
	EURO STOXX	-1.5164	0.0000	***	
CAJAME	Intercept	49.4150	0.0000	***	0.6115
	Event-Dummy	16.5396	0.0000	***	
	EURO STOXX	-0.2649	0.0000	***	
CMZB	Intercept	127.1131	0.0000	***	0.5837
	Event-Dummy	99.9898	0.0000	***	
	EURO STOXX	-0.2116	0.0869	*	
DANBNK	Intercept	62.1165	0.0000	***	0.4836
	Event-Dummy	39.5686	0.0000	***	
	EURO STOXX	1.3054	0.0000	***	
DB	Intercept	105.1503	0.0000	***	0.7624
	Event-Dummy	230.3374	0.0000	***	
	EURO STOXX	-1.1493	0.0000	***	
DEXIA	Intercept	271.8323	0.0000	***	0.1154
	Event-Dummy	13.0426	0.4045		
	EURO STOXX	1.2954	0.0000	***	
ERSTBK	Intercept	241.5747	0.0000	***	0.4023
	Event-Dummy	161.5175	0.0000	***	
	EURO STOXX	4.3175	0.0000	***	
HSBC	Intercept	72.2385	0.0000	***	0.7011

	Event-Dummy	79.3761	0.0000	***	
	EURO STOXX	-0.4252	0.0000	***	
HVB	Intercept	85.8829	0.0000	***	0.6047
	Event-Dummy	10.2923	0.0021	***	
	EURO STOXX	-0.7512	0.0000	***	
INTNED	Intercept	73.3793	0.0000	***	0.3291
	Event-Dummy	43.4981	0.0000	***	
	EURO STOXX	0.6248	0.0000	***	
ISPIM	Intercept	115.7043	0.0000	***	0.6680
	Event-Dummy	113.9762	0.0000	***	
	EURO STOXX	-0.3178	0.0086	***	
KNFP	Intercept	85.6845	0.0000	***	0.6320
	Event-Dummy	34.2257	0.0000	***	
	EURO STOXX	-0.3325	0.0000	***	
LLOYDS	Intercept	63.6049	0.0000	***	0.5645
	Event-Dummy	62.1662	0.0000	***	
	EURO STOXX	-0.2352	0.0058	***	
MONTE	Intercept	548.8219	0.0000	***	0.7423
	Event-Dummy	925.3677	0.0000	***	
	EURO STOXX	-25.2781	0.0000	***	
NBHSS	Intercept	32.9817	0.0000	***	0.7162
	Event-Dummy	29.5159	0.0000	***	
	EURO STOXX	-0.2334	0.0000	***	
POPSM	Intercept	199.6881	0.0000	***	0.8282
	Event-Dummy	25.6994	0.0000	***	
	EURO STOXX	-2.4272	0.0000	***	
RABOBK	Intercept	46.7557	0.0000	***	0.4727
	Event-Dummy	41.0879	0.0000	***	
	EURO STOXX	-0.1400	0.0357	**	
RBSNV	Intercept	48.2819	0.0000	***	0.2391
	Event-Dummy	42.5022	0.0000	***	
	EURO STOXX	0.5273	0.0000	***	
RZB	Intercept	200.9942	0.0000	***	0.1479
	Event-Dummy	54.2475	0.0000	***	
	EURO STOXX	0.2888	0.0592	*	
SANTAN	Intercept	140.8273	0.0000	***	0.8552
	Event-Dummy	57.7865	0.0000	***	
	EURO STOXX	-2.5133	0.0000	***	
SEB	Intercept	57.9355	0.0000	***	0.4445
	Event-Dummy	40.6968	0.0000	***	
	EURO STOXX	0.2461	0.0000	***	

SHBASS	Intercept	42.5992	0.0000	***	0.2741
	Event-Dummy	26.6038	0.0000	***	
	EURO STOXX	0.2206	0.0000	***	
SNSBNK	Intercept	422.5852	0.0000	***	0.5518
	Event-Dummy	49.1571	0.0055	***	
	EURO STOXX	-3.5649	0.0000	***	
SOCGEN	Intercept	91.8073	0.0000	***	0.3902
	Event-Dummy	50.9531	0.0000	***	
	EURO STOXX	-0.0953	0.3017		
SWEDA	Intercept	35.5715	0.0000	***	0.2701
	Event-Dummy	19.6730	0.0000	***	
	EURO STOXX	0.1784	0.0000	***	
UBIIM	Intercept	119.2711	0.0000	***	0.8986
	Event-Dummy	22.1392	0.0000	***	
	EURO STOXX	-2.3238	0.0000	***	
UCGIM	Intercept	181.7247	0.0000	***	0.7639
	Event-Dummy	149.0728	0.0000	***	
	EURO STOXX	-1.3627	0.0000	***	
WESTLB	Intercept	174.6689	0.0000	***	0.5740
	Event-Dummy	30.4053	0.0001	***	
	EURO STOXX	-1.5444	0.0000	***	

*** Coefficient significantly different from 0 at the 1 percent level or less.

** Coefficient significantly different from 0 at the 5 percent level.

* Coefficient significantly different from 0 at the 10 percent level.

Table 4: This table reports the estimation results of the market return model in eq.(2). The estimation method is OLS. The sample comprises daily data for 38 EU banks (see Table 2) for the period 24/03/2015 - 12/02/2016. The dependent variable is the difference between CDS spread of subordinated and seniore bank debt, the regressors are the EUROSTOXX Index and a dummy variable that equals 1 in the first 10 trading days of Febrary 2016 and 0 otherwise. The dummy coefficients are the estimated Abnormal Returns of the CDS spreads difference. Bank fixed-effects are included in the model. Multiple R^2 for each equation and p-values for each estimated coefficient are reported.

Bank		**Estimate**	**Pr(>|t|)**	**Signif**	**Multiple R^2**
ACAFP	Intercept	43.0717	0.0000	***	0.7119
	Event-Dummy	27.5758	0.0000	***	
	EURO STOXX	-0.4558	0.0000	***	
BACR	Intercept	37.3430	0.0000	***	0.6942
	Event-Dummy	28.4283	0.0000	***	
	EURO STOXX	-0.7802	0.0000	***	
BACRED	Intercept	99.6104	0.0000	***	0.6300
	Event-Dummy	123.5215	0.0000	***	
	EURO STOXX	0.4862	0.0000	***	
BANSAB	Intercept	111.9102	0.0000	***	0.5897
	Event-Dummy	-9.6591	0.0835	*	
	EURO STOXX	-1.4852	0.0000	***	
BBVASM	Intercept	75.9548	0.0000	***	0.7773
	Event-Dummy	43.6101	0.0000	***	
	EURO STOXX	-0.9042	0.0000	***	
BFCM	Intercept	76.5862	0.0000	***	0.4545
	Event-Dummy	37.5196	0.0000	***	
	EURO STOXX	-0.1797	0.0069	***	
BKTSM	Intercept	62.3092	0.0000	***	0.0005
	Event-Dummy	1.3949	0.7570		
	EURO STOXX	0.0052	0.9454		
BNP	Intercept	36.3465	0.0000	***	0.7983
	Event-Dummy	31.7132	0.0000	***	
	EURO STOXX	-0.3507	0.0000	***	
BPIIM	Intercept	104.1720	0.0000	***	0.8328
	Event-Dummy	69.6390	0.0000	***	
	EURO STOXX	-3.1751	0.0000	***	
BYLAN	Intercept	85.4862	0.0000	***	0.4654
	Event-Dummy	27.0068	0.0000	***	
	EURO STOXX	-0.8081	0.0000	***	
CAIXAB	Intercept	61.9268	0.0000	***	0.4805
	Event-Dummy	3.3089	0.3044		
	EURO STOXX	-0.6167	0.0000	***	
CAJAME	Intercept	27.5950	0.0000	***	0.3662
	Event-Dummy	5.9853	0.0000	***	
	EURO STOXX	-0.1024	0.0000	***	
CMZB	Intercept	80.9850	0.0000	***	0.5958

	Event-Dummy	63.6492	0.0000	***	
	EURO STOXX	-0.0797	0.2839		
DANBNK	Intercept	42.2378	0.0000	***	0.6519
	Event-Dummy	36.9668	0.0000	***	
	EURO STOXX	1.4690	0.0000	***	
DB	Intercept	59.7750	0.0000	***	0.7708
	Event-Dummy	125.0176	0.0000	***	
	EURO STOXX	-0.5707	0.0000	***	
DEXIA	Intercept	167.0546	0.0000	***	0.1127
	Event-Dummy	13.4697	0.3899		
	EURO STOXX	1.2841	0.0000	***	
ERSTBK	Intercept	162.5913	0.0000	***	0.3465
	Event-Dummy	141.4896	0.0000	***	
	EURO STOXX	3.4364	0.0000	***	
HSBC	Intercept	39.7597	0.0000	***	0.6246
	Event-Dummy	39.4457	0.0000	***	
	EURO STOXX	-0.2725	0.0000	***	
HVB	Intercept	56.4528	0.0000	***	0.6755
	Event-Dummy	8.5859	0.0029	***	
	EURO STOXX	-0.7763	0.0000	***	
INTNED	Intercept	45.1168	0.0000	***	0.3808
	Event-Dummy	22.2893	0.0000	***	
	EURO STOXX	0.2249	0.0000	***	
ISPIM	Intercept	68.2845	0.0000	***	0.7853
	Event-Dummy	64.8756	0.0000	***	
	EURO STOXX	-0.5745	0.0000	***	
KNFP	Intercept	69.6465	0.0000	***	0.5890
	Event-Dummy	26.5785	0.0000	***	
	EURO STOXX	-0.2982	0.0000	***	
LLOYDS	Intercept	40.2662	0.0000	***	0.5191
	Event-Dummy	35.6010	0.0000	***	
	EURO STOXX	-0.4453	0.0000	***	
MONTE	Intercept	341.2731	0.0000	***	0.6764
	Event-Dummy	624.4190	0.0000	***	
	EURO STOXX	-19.2158	0.0000	***	
NBHSS	Intercept	15.8641	0.0000	***	0.0268
	Event-Dummy	3.2239	0.0702	*	
	EURO STOXX	0.0731	0.0153	**	
POPSM	Intercept	96.8969	0.0000	***	0.3341
	Event-Dummy	24.2988	0.0001	***	
	EURO STOXX	-0.5870	0.0000	***	
RABOBK	Intercept	26.1889	0.0000	***	0.3173
	Event-Dummy	38.6978	0.0000	***	
	EURO STOXX	-0.0117	0.8805		
RBSNV	Intercept	13.9570	0.0000	***	0.2349
	Event-Dummy	12.5322	0.0000	***	

	EURO STOXX	0.1626	0.0000	***	
RZB	Intercept	136.0921	0.0000	***	0.0253
	Event-Dummy	13.5751	0.0819	*	
	EURO STOXX	0.3115	0.0183	**	
SANTAN	Intercept	80.4592	0.0000	***	0.7708
	Event-Dummy	45.2275	0.0000	***	
	EURO STOXX	-1.4024	0.0000	***	
SEB	Intercept	37.1800	0.0000	***	0.3515
	Event-Dummy	29.8280	0.0000	***	
	EURO STOXX	0.6320	0.0000	***	
SHBASS	Intercept	21.3703	0.0000	***	0.2929
	Event-Dummy	28.0619	0.0000	***	
	EURO STOXX	0.4701	0.0000	***	
SNSBNK	Intercept	88.5955	0.0000	***	0.0560
	Event-Dummy	39.2021	0.0012	***	
	EURO STOXX	0.6466	0.0015	***	
SOCGEN	Intercept	57.4440	0.0000	***	0.5776
	Event-Dummy	30.1258	0.0000	***	
	EURO STOXX	-0.3772	0.0000	***	
SWEDA	Intercept	20.2599	0.0000	***	0.4943
	Event-Dummy	18.4059	0.0000	***	
	EURO STOXX	0.7017	0.0000	***	
UBIIM	Intercept	60.4121	0.0000	***	0.8107
	Event-Dummy	12.2982	0.0004	***	
	EURO STOXX	-1.3638	0.0000	***	
UCGIM	Intercept	113.1044	0.0000	***	0.7678
	Event-Dummy	82.4960	0.0000	***	
	EURO STOXX	-0.9782	0.0000	***	
WESTLB	Intercept	129.8448	0.0000	***	0.5717
	Event-Dummy	22.5326	0.0001	***	
	EURO STOXX	-1.1473	0.0000	***	

*** Coefficient significantly different from 0 at the 1 percent level or less.

** Coefficient significantly different from 0 at the 5 percent level.

* Coefficient significantly different from 0 at the 10 percent level.

Table 5: This table reports Summary Statistics of the Abnormal Returns estimated in eq.(1) and (2), i.e. the Event-Dummy coefficients in Tables (3) and (4). Statistics are evaluated on the whole sample excluding one influent outlier observation (*Monte dei Paschi di Siena*). Abnormal Returns are measured in basis points (bps).

	Mean	Median	Std. Dev.	Min	Max	Obs.
eq. (1)	58.9022	42.5022	50.9581	7.7906	230.3374	37
eq. (2)	36.9870	28.4283	34.2427	-9.6591	141.4896	37

Table 6: This table shows the results of a placebo test relative to the event-studies of eq.(1) and (2). The event-window is set on the first 10 trading days of December 2015, so that the estimated Abnormal Returns are expected to be not statistically significant or negative. Summary Statistics of the Abnormal Returns on the whole sample are reported. Abnormal Returns are measured in basis points (bps).

	Mean	Median	Std. Dev.	Min	Max	Obs.
eq. (1)	-20.8598	-17.8420	17.9617	-82.6563	4.0497	38
eq. (2)	-9.5708	-9.8283	16.7335	-82.5571	28.1992	38

Table 7: This table reports Summary Statistics of the explanatory variables in eq.(3) and (4). The sample is restricted to about 65% of EU banks of the whole sample (see Table (2)) due to unavailable quarterly balance sheet data for the period Q42014-Q12017. *Sovereign spread* is the spread between the 10-year sovereign yield and the German 10-year Bund yield; *EONIA* is the lagged value (by one quarter) of the Euro OverNight Index Average; *VSTOXX* is the volatility index of the Euro Stoxx; *Core Tier 1* is the lagged ratio of banks' core Tier 1 capital to its total risk-weighted assets; *ROE* is the Return over Equity measure; *Total assets* is the lagged value of banks' total assets in millions of euros; *Problem loans gross loans* is the lagged amount of problem loans (either nonperforming and impaired) divided by the gross customer loans value; *Domestic subsidiaries* is the share of domestic subsidiaries for each bank.

	Mean	Median	Std. Dev.	Min	Max	Obs.
Sovereign spread	0.6011	0.3045	0.5192	-0.0856	1.7824	81
EONIA	-0.1698	-0.1413	0.1408	-0.3486	0.023	10
VSTOXX	22.7522	22.9251	3.7849	15.4986	28.6110	10
Core Tier 1	13.3074	12.2715	3.2292	8.1463	25.1184	260
ROE	5.7114	6.9841	10.2850	-109.3289	20.4445	260
Total assets (millions)	790.15	610.46	650.8624	56.34	2487.11	260
Problem loans / gross loans	4.9502	3.5787	4.5579	0.3472	16.9405	138
Domestic subsidiaries	0.4721	0.4048	0.2373	0.1095	0.8788	25

Table 8: This table reports the estimation results of eq.(3) and (4). Columns (1) and (2) refer to the fixed-effects model in eq.(3), while columns (3) and (4) refer to the pooled regression in eq.(4). The sample comprises quarterly data for EU banks for the period Q42014-Q12017 (see Table (2)). The dependent variable is the quarterly average Abnormal Return of CDS spread differential between subordinated and senior debt of each bank. Abnormal returns are evaluated as daily regression residuals and prediction errors from the market return model in eq.(2) without the dummy variable. The estimation window is 10/2014 - 01/2016. The differences between observed and predicted values of the CDS differentials are the daily abnormal returns. They are quarterly averaged to be used in eq.(3). The covariates are the spread between the 10-year sovereign yield and the German 10-year Bund yield (*Sovereign spread*), the lagged value (by one quarter) of the Euro OverNight Index Average (*EONIA*), the volatility index of the Euro Stoxx (*VSTOXX*), the lagged value of the logarithm of banks' total assets (*log(total assets)*), the lagged ratio of banks' core Tier 1 capital to its total risk-weighted assets (*Core Tier 1*), the Return over Equity measure (*ROE*), the lagged amount of problem loans divided by the gross customer loans value (*Problem loans*) and the share of domestic subsidiaries for each bank (*Domestic subsidiaries*). Models in columns (1) and (2) include bank-specific fixed effects (not reported). R^2, estimated coefficients and related standard errors (in parenthesis) are reported. The following tests are also reported: F-test for joint significance of coefficients, F-test for individual fixed effects significance, the Hausman test to compare fixed and random effects, tha Durbin-Watson test for serial correlation and the Breusch-Pagan LM test for cross-sectional dependence.

	(1)	**(2)**	**(3)**	**(4)**
Sovereign spread	24.239**	24.876*	-2.665	-4.832
	(12.056)	(13.193)	(3.558)	(4.03)
EONIA_{t-1}	-75.666***	-104.096***	-67.99***	-75.913***
	(15.431)	(18.534)	(14.49)	(15.571)
VSTOXX	1.794***	1.767***	2.091***	2.095***
	(0.484)	(0.515)	(0.532)	(0.57)
$log(\text{total assets})_{t-1}$	-60.738**	-39.757	-6.593***	-5.262**
	(29.321)	(33.607)	(2.093)	(2.269)
$\text{Core Tier } 1_{t-1}{}^b$	-6.32**	-6.883***	-1.235**	-0.836
	(2.459)	(2.53)	(0.616)	(0.708)
ROE^a	0.059	0.08	-0.29	-0.224
	(0.178)	(0.184)	(0.183)	(0.193)
$\text{Problem loans}_{t-1}$		7.144**		0.911
		(2.948)		(0.558)
Domestic subsidiaries (%)			-24.693***	-24.083**
			(9.007)	(9.397)
(Intercept)			21.352	2.830
			(24.367)	(27.299)
R^2	0.1565	0.1829	0.1384	0.1525
F-test (p-value)	6.75e-07	3.8e-07	6.09e-06	1.12e-05
Number of Banks	26	24	25	23
Total observations	260	240	250	230

Fixed effects	Yes	Yes	No	No
Fixed-effects F-test (p-value)	1e-06	1.38e-06		
Hausman Chisq-test (p-value)	6.93e-08	0.0155		
Durbin-Watson test (p-value)	1.87e-09	2.13e-08	<2.2e-16	<2.2e-16
Breusch-Pagan Chisq-test (p-value)	<2.2e-16	9.45e-11	<2.2e-16	<2.2e-16

*** Coefficient significantly different from 0 at the 1 percent level or less.

** Coefficient significantly different from 0 at the 5 percent level.

* Coefficient significantly different from 0 at the 10 percent level.

[a] All models have been estimated with *Return over Assets*(ROA) instead of ROE leading to analogous results.

[b] All models have been estimated with *Total Capital ratio* instead of *Core Tier 1* leading to analogous results.