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DETERMINANTS OF EUROPEAN BANKS' DEFAULT RISK

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Determinants of European Banks' Default Risk *

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Abstract

Using bank CDS spreads, we examine three types of determinants of Euro Area bank default risk in the period 2008-2019: bank characteristics related to new regulation, the bank-sovereign nexus and the monetary policy stance. We find that Basel 3 regulation improves the banks' risk profile since higher capital ratios and more stable deposit funding contribute significantly to lower CDS spreads. We confirm the persistence of the bank-sovereign interconnectedness and find that sovereign default risk is transmitted to bank risk with an amplification factor. The ECB monetary policy stance is neutral with respect to bank risk, hence we find no evidence of perceived excessive risk-taking behavior.

Keywords: bank default risk, CDS spreads, monetary policy, sovereign risk

JEL classification: G21, G32, E52

1 Introduction

We investigate the drivers of Euro Area bank default risk in the period following the great financial crisis (GFC), using bank CDS spreads. Arguably, Euro Area banks have a risk

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profile problem. International organizations and bank supervisors claim that a large proportion of European banks are unable to achieve a return on equity above their cost of equity, implying that returns fail to compensate risk (EBA, 2018; ECB, 2018; IMF, 2020). Several banks failed in the stress tests conducted by the EBA/ECB in the post-GFC period and were ordered to take remedial actions. Following the GFC, a number of banks had to be bailed in or were recapitalized by the government, the most publicized cases were Banco Popular and Banca MPS in 2017.

We distinguish three types of determinants of bank default risk, with potentially diverging effects. First, stricter regulation and tougher supervision introduced after the GFC should improve the risk profile of banks. The cornerstone of the new regulatory framework is Basel 3, which imposes higher capital requirements and new liquidity rules on the banks. Stricter oversight of large Euro Area banks is conducted by the ECB since 2014 and this has prompted banks to strengthen their risk management (Fiordelisi et al., 2017). Next to single supervision, the European Banking Union contains new rules on mandatory bail-in of ailing banks organized by the Bank Recovery and Resolution Directive, in legal force since 2015. The introduction of these rules has been associated with lower perceived bank risk (Fiordelisi et al., 2020). Finally, various types of macroprudential measures to curb bank risk have been introduced by bank supervisors and research finds that these measures have in general lowered bank risk (Meuleman and Vander Vennet, 2020). Second, macroeconomic conditions may worsen the risk profile of the banks. Following the GFC, some banks were hit by the sovereign debt crisis, often caused by excessive exposures to their domestic sovereign (De Bruyckere et al., 2013). The economic recessions following the GFC and the sovereign debt crisis saddled banks with non-performing loans, which were tackled only very slowly (Bongini et al., 2019). Third, The monetary stance of the ECB has been accommodative throughout the period under investigation and while this may have been beneficial for banks in terms of profitability, low for long interest rates may create risk-taking incentives, leading banks to invest in riskier loans and securities (Heider et al., 2019; Bubeck et al., 2020).

Hence the ultimate impact of regulation, monetary policy and bank strategic choices on perceived bank default risk are an empirical matter. Previous papers have investigated bank risk based on their CDS spreads, but these results related mostly to the pre-GFC period

and they were based on a combination of bank and market variables (Annaert et al., 2013; Chiaramonte and Casu, 2013; Samaniego-Medina et al., 2016; Drago et al., 2017). Our contribution is to analyze the drivers of bank risk in the post-GFC period in a coherent empirical framework by incorporating not only bank-specific characteristics related to new regulation, but also accounting for the effect of sovereign risk and the monetary policy stance.

2 Data and methodology

In order to simultaneously assess the impact of bank characteristics and sovereign risk or the monetary policy stance, we subsequently estimate the following two specifications:

$$CDS_{i,t} = \alpha_i + \lambda_t + \sum_{k=1}^{K} \beta_k \, BANK_{k,i,t} + \delta CDS_{c,t}^{Sov} + \varepsilon_{i,t} \tag{1}$$

$$CDS_{i,t} = \alpha_i + \sum_{k=1}^{K} \beta_k \, BANK_{k,i,t} + \gamma MPS_t + \varepsilon_{i,t} \tag{2}$$

where $CDS_{i,t}$ represents the CDS spread of bank i at time t. The k^{th} fundamental of bank i is contained in the vector $BANK_{k,i}$. We include the CDS spread of the home country of the bank (CDS^{Sov}) and the monetary policy stance MPS. In all the regressions, we do not include the monetary policy stance and the sovereign CDS spread simultaneously since unconventional monetary policy actions by the ECB, especially its asset purchases, were designed to tighten sovereign spreads (Rostagno et al., 2019). Soenen and Vander Vennet (2021) demonstrate that the ECB monetary policy shocks have a significant direct effect on sovereign CDS spreads and, through that channel, also indirectly affect bank CDS spreads. The model controls for unobserved heterogeneity at the bank level by including bank fixed effects (α_i). In the sovereign risk model, we include time fixed effects to control for common macroeconomic shocks (λ_t).

Since we use a combination of variables with a daily frequency and bank accounting information which is available on a lower frequency, we opt to conduct our analysis at a monthly frequency. Hence CDS spreads, MPS and CDS^{Sov} are monthly averages of

daily observations. The bank-specific variables have a quarterly frequency for banks that report their balance sheet and income statement quarterly (typically listed banks), annually otherwise. The bank-specific variables are matched using the latest values from available (quarterly or annual) reports.

We capture bank default risk by their CDS spreads because they are a market-based, unbiased measure of bank default risk (Altavilla et al., 2018). CDS spreads on 5-year senior bank bonds are retrieved from Markit and we obtain bank-specific variables from SNL[1].

We limit the sample to banks with loans/assets or deposits/liabilities ratios above 20% to ensure that we focus on banks engaged in financial intermediation. Moreover, the frequency of the CDS spread quotes has to exceed 25% over the sample period. The application of these selection criteria results in a sample of 49 banks from 9 Euro Area countries in the period of 2008-2019. The definition and descriptive statistics for the CDS spreads of banks and sovereigns and the bank-specific variables are reported in Table 1. An overview of the banks in the sample is provided in Table 2.

Table 1: Descriptive statistics.

Variable	Definition	Mean	SD	P1	P50	P99
CDS Bank	CDS spread banks 5-year	202.27	208.85	23.13	139.80	1,081.40
CDS Sovereign	CDS spread sovereigns 5-year	97.54	144.19	5.03	48.88	764.79
CAP	Unweighted capital ratio	6.19	2.41	2.07	6.18	12.65
CET1	Common equity tier-1 ratio	13.00	18.78	5.08	11.39	65.13
DEP	Deposits over liabilities	48.24	15.96	10.73	50.00	80.21
INTERBANK	Interbank funding over liabilities	15.99	8.98	1.53	14.31	43.88
DIV	Net non-interest income over net income	38.43	14.08	3.80	37.76	75.35
LTA	Loans over assets	59.75	15.85	20.06	62.54	87.71
ROA	Pre-tax profits over assets	0.07	0.52	−2.05	0.12	1.15
ROE	Pre-tax proftis over equity	0.89	11.11	−42.92	1.82	18.89
NIM	Net interest income over assets	0.70	0.55	0.14	0.48	2.40
NPL	Non-performing loans over loans	7.31	6.39	0.58	5.00	29.74
SIZE	Natural logarithm of assets	19.13	1.19	16.77	19.10	21.45
MPS	Wu/Xia shadow rate	−2.19	2.65	−7.72	−1.08	1.93

[1]In non-reported robustness checks we also conducted the analysis on CDS spreads on subordinated bank bonds and with 1-year maturities. The results are qualitatively similar.

Table 2: List of banks in the sample.

Bank	
Erste Group Bank	Banca Popolare di Milano
Raiffeisen Bank International	Banco BPM
Raiffeisen Zentralbank Österreich	Banco Popolare
UniCredit Bank Austria	Intesa Sanpaolo
BNP Paribas Fortis	Mediobanca - Banca di Credito Finanziario
KBC Bank	UniCredit
BNP Paribas	Unione di Banche Italiane
Banque Fédérative du Crédit Mutuel	ABN AMRO Group
Crédit Agricole	Coöperatieve Rabobank
Crédit Lyonnais	ING Bank
Natixis	NIBC Bank
Société Générale	Banco BPI
Bayerische Landesbank	Banco Comercial Português
Commerzbank	Banco Espírito Santo
Deutsche Bank	Caixa Geral de Depósitos
Hamburg Commercial Bank	Novo Banco
IKB Deutsche Industriebank	Banco Bilbao Vizcaya Argentaria
Landesbank Baden-Württemberg	Banco Pastor
NORD/LB Norddeutsche Landesbank	Banco Popular Español
Portigon	Banco Santander
UniCredit Bank	Banco de Sabadell
Governor and Company of the Bank of Ireland	Bankia
Permanent TSB Group Holdings	Bankinter
Banca Monte dei Paschi di Siena	CaixaBank
Banca Nazionale del Lavoro	

3 Empirical Results

For the discussion of the findings, we combine three tables. Table 3 presents the regression results for the full period under investigation. In Table 4 we subdivide the sample in two subperiods and core versus periphery country banks. The time split is inspired by regulatory changes (e.g. the ECB is responsible for bank supervision from November 2014 onwards and the BRRD went into full legal force in 2015) as well as a shift in monetary policy regime (from 2014 onwards, the ECB deposit rate has become negative and in 2015 the ECB started its asset purchase program). Table 5 presents the results of a number of robustness checks with alternative bank variables. In this table, we only show the variables of interest, but the other bank-specific variables, as in Table 3, are included as well.

To analyze the impact of bank fundamentals on their perceived risk profile, we include bank variables related to new regulation, variables capturing the banks' asset structure, funding mix and revenue composition, and outcome variables in terms of asset quality and profitability.

Across various specifications in Tables 3 to 5, the unweighted capital ratio (CAP) is

Table 3: Baseline regression results. The first and second column show the results with respect to bank fundamentals and sovereign credit risk. To control for a potential bank to sovereign credit risk channel, we estimate the model both in OLS (column 1) and using a GMM estimator (column 2). In column 3 we show the resutls with respect to the monetary policy stance proxied by the Wu/Xia shadow rate. All estimations use bank fixed effects to control for unobserved heterogeneity. Time fixed effects are only included in the estimations without the monetary policy stance. Standard errors are Driscoll Kraay standard errors which are robust to general forms of cross-sectional and temporal dependence when the time dimension becomes large. *, ** and *** represent significance a the 10%, 5% and 1% percent level, respectively.

	CDS 5-year senior bond		
	OLS - Sov	IV - Sov	OLS - MPS
CAP	-6.652^{***}	-6.522	-22.099^{***}
	(2.115)	(6.665)	(5.500)
SIZE	-4.057	-4.745	-6.229
	(16.652)	(44.253)	(33.444)
LTA	2.652^{***}	2.450	4.805^{***}
	(0.953)	(1.630)	(1.089)
DIV	-0.236	-0.254	-0.011
	(0.260)	(0.501)	(0.569)
NPL	3.976^{***}	3.946^{***}	4.724^{*}
	(0.921)	(1.500)	(2.489)
ROA	-31.966^{***}	-31.648^{**}	-36.778^{**}
	(6.921)	(16.012)	(15.974)
DEP	-2.821^{***}	-2.593^{**}	-6.345^{***}
	(0.952)	(1.211)	(1.779)
$CDS^{HOME\ SOV}$	1.110^{***}	1.132^{***}	
	(0.039)	(0.064)	
MPS			3.262
			(3.707)
Bank fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	No
R^2	0.781	0.586	0.250
No. of banks	49	49	49
No. of obs	5,638	5,601	5,638

Table 4: Time and geography extensions. All estimations use bank fixed effects to control for unobserved heterogeneity. Time fixed effects are only included in the estimations without the monetary policy stance. Standard errors are Driscoll Kraay standard errors which are robust to general forms of cross-sectional and temporal dependence when the time dimension becomes large. *, ** and *** represent significance a the 10%, 5% and 1% percent level, respectively.

	Time		Geography		Time		Geography	
	< 2015	> 2015	Core	Periphery	< 2015	> 2015	Core	Periphery
CAP	−30.500***	−24.728***	−15.894***	−31.195***	−5.635	−5.478	−8.114***	−7.812**
	(9.911)	(7.281)	(2.846)	(6.614)	(4.633)	(7.593)	(2.351)	(3.696)
SIZE	183.157***	−122.995***	−56.190***	72.331	45.754	−59.456*	−14.336	−84.507***
	(53.743)	(33.604)	(12.767)	(47.012)	(30.587)	(32.716)	(15.540)	(17.065)
LTA	4.791***	4.870***	4.956***	3.476	4.390***	1.264	5.336***	0.856
	(1.627)	(1.498)	(1.554)	(2.327)	(1.604)	(1.039)	(1.744)	(0.768)
DIV	0.023	−0.777	−0.757*	−0.472	−0.125	−1.121***	0.030	−1.304**
	(0.611)	(0.725)	(0.391)	(1.132)	(0.253)	(0.391)	(0.259)	(0.546)
NPL	10.004*	0.065	1.548**	5.324	2.797**	1.358	1.197**	4.123***
	(5.364)	(1.692)	(0.679)	(3.458)	(1.104)	(0.950)	(0.594)	(1.235)
ROA	−30.475	28.411***	30.458**	−80.730***	−25.119**	14.894	−6.843	−38.382***
	(20.338)	(9.563)	(14.082)	(24.927)	(10.694)	(9.186)	(10.727)	(13.164)
DEP	−4.466*	−4.764**	−5.578***	−5.548*	−3.677**	−2.027*	−4.630**	−3.166***
	(2.572)	(1.885)	(1.773)	(2.883)	(1.506)	(1.122)	(2.005)	(0.943)
MPS	−1.707	3.798	7.420***	6.659				
	(19.147)	(2.950)	(2.273)	(8.186)				
$CDS^{HOME\ SOV}$					1.186***	1.654***	0.796***	1.187***
					(0.043)	(0.122)	(0.102)	(0.068)
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
R^2	0.121	0.160	0.376	0.269	0.807	0.525	0.600	0.859
No. of banks	47	47	25	24	47	47	25	24
No. of obs	3,202	2,436	3,035	2,603	3,202	2,436	3,035	2,603

negative and highly significant, indicating that capital is perceived as an effective buffer against unexpected losses, which is unambiguously associated with lower bank default risk. While we prefer the unweighted capital ratio, given the potential biases associated with internal ratings (Mariathasan and Merrouche, 2014), Table 5 shows that the CET1/RWA ratio is also negative and significant. These results are consistent with previous evidence that capital buffers decrease banks' market beta (Baele et al., 2007), as well as their systemic risk (Laeven et al., 2016) and several papers have demonstrated that higher capital before the crisis increased the likelihood of survival and enhanced bank performance in distress periods (Berger and Bouwman, 2013; Vazquez and Federico, 2015). Hence, the stricter capital requirements introduced by Basel 3 have made the banking system safer and this is recognized by CDS markets.

Similarly, since Basel 3 imposes the banks to comply with a net stable funding ratio, we include the proportion of deposits in total liabilities (DEP) because deposits are the most important source of stable funding. Across the specifications, DEP is indeed associated with lower bank CDS spreads and, hence, a lower perceived bank default risk, consistent with

Table 5: Robustness: alternative specifications for bank fundamentals. All estimations use bank and time fixed effects to control for unobserved heterogeneity and common macroeconomic shocks. Standard errors are Driscoll Kraay standard errors which are robust to general forms of cross-sectional and temporal dependence when the time dimension becomes large. *, ** and *** represent significance at the 10%, 5% and 1% percent level, respectively.

	CDS 5-year senior bond						
	Capital		Profit			Funding	
CAP	-6.652^{***}						
	(2.115)						
CET1		-2.502^{**}					
		(1.006)					
ROA			-31.966^{***}				
			(6.921)				
ROE				-1.384^{***}			
				(0.457)			
NIM					-26.800^{***}		
					(8.652)		
DEP						-2.821^{***}	
						(0.952)	
INTERBANK							0.690
							(0.646)
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.781	0.781	0.781	0.780	0.779	0.781	0.777
No. of banks	49	48	49	49	49	49	49
No. of obs	5,638	5,445	5,638	5,638	5,638	5,638	5,575

evidence in Mergaerts and Vander Vennet (2016). As a robustness check, we alternatively include the reliance on short-term interbank funding and Table 5 shows that this is associated with higher CDS spreads, demonstrating the dark side of wholesale funding (Huang and Ratnovski, 2011). Hence, markets push banks towards less reliance on potentially volatile sources of wholesale funding, corroborating the usefulness of the net stable funding ratio introduced by the Basel 3 framework.

In terms of bank performance variables, we focus on profitability (return on assets, ROA), and we include the non-performing loans ratio (NPL) as a proxy for the quality of the bank's lending portfolio. For the entire period, ROA exhibits a negative and significant coefficient, indicating that more profitable banks are perceived as less risky. This relationship is confirmed in Table 5 where we report similar negative coefficients for ROE or the net interest margin (NIM). However, the geographical split indicates that profitability is an important risk mitigator only for periphery banks. As expected, NPL is associated with higher bank CDS spreads, which is consistent with NPLs conveying high risk and lower bank valuations, as also reported by Simoens and Vander Vennet (2020). This effect is mostly attributable to the pre-2015 period, characterized by the NPL fallout of the financial and sovereign debt crisis. This result underscores the necessity of early intervention to tackle bad loans following a banking crisis, something that was not implemented in a timely fashion for a substantial fraction of Euro Area banks. Among the control variables, only LTA is significant, indicating that banks primarily engaged in lending are perceived as more risky, while bank size (SIZE) and revenue diversification (DIV) remain mostly insignificant.

To capture sovereign credit risk, we use the sovereign CDS spread on 5-year senior bonds. Our findings confirm the strongly significant association between banks and their home sovereigns that has been documented in previous literature (De Bruyckere et al., 2013; Fratzscher and Rieth, 2019) and suggests that higher perceived sovereign default risk is transmitted to bank default risk with an amplification factor. The result for the sovereign CDS spread is confirmed in a GMM setting using the first 10 lags of sovereign credit risk as an instrument, shown in column 2 of Table 3, thus controlling for reverse causality. This finding indicates that restoring bank health after a crisis requires decisive action in terms of severing the link between sovereigns and banks. Our finding that the bank-sovereign

feedback loop persists in the 2015-2019 period moreover suggests that the BRRD is not perceived by CDS markets as a credible bail-in regime (see also Pancotto et al. (2019)). Several policy measures have been proposed to tackle the bank-sovereign doom loop more decisively, e.g. attaching weights to sovereign exposures for the calculation of capital requirements or imposing exposure limits on the banks (Alogoskoufis and Langfield, 2020). We examine potential heterogeneity in the transmission of sovereign to bank credit risk by interacting relevant bank fundamentals with sovereign credit risk. It turns out that only the interaction with NPL is positive and significant, indicating that the transmission of sovereign to bank default risk is amplified for banks with poor loan quality.

To capture the stance of ECB monetary policy, we cannot use the policy rate because of the zero lower bound, nor the ECB balance sheet because some important policy measures did not affect the balance sheet (e.g. OMT). We use the Wu and Xia (2016, 2020) shadow rate for the Euro Area because it is not constrained by zero and encompasses all types of unconventional monetary policy. Since the estimation of the shadow rate uses the entire yield curve, it captures not only the implementation of monetary policy actions but also anticipation by market participants, which is relevant for the assessment of the banks' risk profile. In terms of ECB monetary policy, the insignificant coefficient on the shadow rate indicates that the CDS market perceives the monetary policy stance as neutral for the risk profile of the banks. This finding is consistent with Altavilla et al. (2018), Soenen and Vander Vennet (2021) and Albertazzi et al. (2020) who conclude that, on balance, the beneficial spillovers to bank stability from the ECB monetary policy measures introduced since the crisis outweigh the adverse spillovers. Our results are not consistent with the hypothesis that expansionary (unconventional) monetary policy causes excessive risk taking by banks, because such behavior would be reflected in higher CDS spreads.

Finally in terms of economic significance Table 6 shows the combination of the variables with significant coefficients and their within-month standard deviation to get insight in the relative importance of the impact of the variables on bank default risk. Sovereign credit risk has the highest economic significance, it is around 10 times higher compared with the bank fundamentals. In terms of bank fundamentals, the economic impact varies from minus 9.6 basis points for capital to minus 23.5 basis points for deposit funding per (corrected)

standard deviation change.

Table 6: Descriptives of the distribution before and after the application of fixed effects.

Variable	SD	Corrected SD	Coefficient	Relative Importance
CDS Sovereign	141.55	114.32	1.11	126.89
CAP	2.41	1.45	−6.65	−9.64
DEP	15.99	8.33	−2.82	−23.50
LTA	16.28	5.01	2.65	13.29
ROA	0.51	0.38	−31.97	−12.14
NPL	6.31	3.56	3.98	14.15

4 Conclusion

After the banking and sovereign crises, European bank CDS spreads have generally declined. We examine whether or not bank default risk is related to three types of determinants: bank characteristics related to new regulation, the bank-sovereign nexus and the monetary policy stance. We find that Basel 3 unambiguously improves the banks' risk profile since higher capital ratios and more stable deposit funding are associated with significantly lower CDS spreads. We confirm that sovereign default risk is transmitted to bank risk with an amplification factor in the entire Euro Area and persists in the period since the sovereign debt crisis. In terms of policy, these results suggest that measures to sever the link between bank and sovereign risk, such as introducing capital weights on sovereign exposures or imposing exposure limits would be sensible. Finally, ECB monetary policy appears to be largely neutral with respect to bank risk, since we find no evidence of perceived excessive risk-taking behavior.

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