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Has the crisis affected the behavior of the rating agencies?

Panel Evidence from the Eurozone

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Abstract

We examine the determinants of credit ratings for the Eurozone countries over the period 2002-2013 within a panel framework that allows for cross-sectional dependence. We find that government debt and the cumulative current account exert a stronger impact on ratings post-2008 compared to the period before.

Keywords: credit ratings; sovereign debt; panel data

JEL classification: C5; C13; F3

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1. Introduction

The significant deterioration of public finances post 2008 has been closely monitored by the three major credit rating agencies (CRAs), Moody's Investor Services, Standard & Poor's and Fitch Ratings (all three account for 95% of the market share[1]). Most of the attention has focused on the Eurozone countries. In the case of Moody's, seven downgrades were recorded for Greece and five downgrades for Ireland, Portugal, and Spain. Standard & Poor's and Fitch Ratings also followed. Decisions made by the CRAs are crucial since sovereign credit ratings measure the probability that a country will default on its debt obligations and therefore set the tone for the sovereign state's borrowing costs.

Earlier work by e.g. Afonso *et al*. (2011) and Cavallo *et al*. (2013) (see also the references therein) examined sovereign credit ratings based on quantitative and qualitative factors. However, an arguably large number of decisions made by the CRAs remain unexplained. This has triggered heavy criticism by European politicians, such as Jose Manuel Barroso (the EU Commission's former President) who raised the issue of "deficiencies in their working methods"[2].

This paper revisits the determinants of credit rating decisions for the Eurozone countries. Our work departs from the earlier literature in three aspects. First, we take into account cross-sectional dependence that is present in the data. Second, we examine the role of the cumulated current account. Third, we assess whether the crisis has impacted on the way CRAs make credit rating decisions.

The paper proceeds as follows. The next section discusses the data and our empirical results. Section 3 concludes.

[1] Economist 31/5/2007 http://www.economist.com/node/9267952

[2] Barroso: Comments to the European Parliament, Wednesday 5 May 2010: http://uk.reuters.com/article/2010/05/05/eu-barroso-ratings-idUKLDE6442B120100505

2. Data description and empirical results

Our dataset includes annual data from 2002 to 2013 for 18 Eurozone countries (216 observations in total). Table 1 presents the data employed and their sources.

Table 1: Data definitions

Variable	Description	Source
Fitch rating	Sovereign rating attributed at 31st December of each year	Fitch
S&P rating	Sovereign rating attributed at 31st December of each year	S&P
Moody's Rating	Sovereign rating attributed at 31st December of each year	Moody's
GDP per capital	Log GDP per capital, US dollars, constant 2005 prices	World Bank
GDP growth rate	Annual percent change of GDP	IMF WEO
Government Debt	General government gross debt as a percent of GDP	IMF WEO
Accumulated current account	Sum of current account balances as a percent of GDP from 1995	IMF WEO
Unemployment Rate	Unemployment rate as a Percent of total labor force	IMF WEO
Inflation Rate	Annual growth rate of Consumer Price Index	IMF WEO
External Balance	External balance on goods and services as a percent of GDP	World Bank
Reserves	Log of total reserves(includes gold, constant 2005 prices)	World Bank
Regulatory Quality	Aggregate Government Indicator	World Bank

The variable of interest is the sovereign credit rating. This study employs the linear transformation of ratings presented in Table 2.

Table 2: Sovereign Rating grades

	Rating agency			Rating grades
	Fitch	S&P	Moody's	(1-21)
Highest quality	AAA	AAA	Aaa	21
High quality	AA+	AA+	Aa1	20
	AA	AA	Aa2	19
	AA-	AA-	Aa3	18
Strong payment	A+	A+	A1	17
Capacity	A	A	A2	16
	A-	A-	A3	15
Adequate payment	BBB+	BBB+	Baa1	14
Capacity	BBB	BBB	Baa2	13
	BBB-	BBB-	Baa3	12
Likely to fulfill	BB+	BB+	Ba1	11
obligations, ongoing	BB	BB	Ba2	10
Uncertainty	BB-	BB-	Ba3	9
High credit risk	B+	B+	B1	8
	B	B	B2	7
	B-	B-	B3	6
Very high credit	CCC+	CCC+	Caa1	5
Risk	CCC	CCC	Caa2	4
	CCC-	CCC-	Caa3	3
Non default with	CC	CC	Ca	
possibility of recovery	C			2
	DDD	SD	C	
Default	DD	D		
	D			1

The model specification we adopt takes into account the cross-sectional dependence that is present in the sample. In line with Gros (2011), we further examine whether the cumulative current account is of importance in a monetary union setting. Further, following Baghai *et al*. (2014), we examine whether credit ratings agencies have changed their behavior during the crisis. The specification we employ can be written as:

$$CRA_{it} = a_0 + \mu_i + \sum_{i=1}^{9} a_i x_{it} + \sum_{i=1}^{9} b_i \overline{x_i} + \sum_{j=1}^{3} c_j D_{crisis} x_{jt} + error_{it},$$

where x_i includes nine variables, namely GDP per capita, growth rate of GDP, government debt, inflation rate, unemployment rate, current account, external balance, log reserves, regulatory quality. D_{crisis} takes the value of 1 for the years 2009 to 2013 and 0 otherwise. Three variables (government debt, current account and external balance) interact with the crisis dummy in line with Gros (2011) who argues that the external sector was of vital importance during the crisis.

The model is estimated using (i) pooled OLS, (ii) fixed effects and (iii) random effects. The Pesaran (2004) test provides convincing evidence that cross sectional dependence exists in the models without the cross-section averages ($\bar{x}$: *cavg*); these preliminary results are not reported due to space limitations but are available on request. In fact, cross-sectional dependence would point to the existence of spill-over effects from one Eurozone country to another[3]. Following from this, we follow the common correlated effects (CCE) approach of Pesaran (2006) that includes the cross-section averages of the independent variables as additional regressors denoted by *cavg* in Tables 3 to 6. The estimated coefficients on the cross-section averages are not interpretable in a meaningful way; these are merely present to blend out the biasing impact of the unobservable common factor (see e.g. Eberhardt, 2012).

Tables 3-5 report the empirical results for each one of the three main CRAs. In each model, the first two columns report all estimated coefficients and associated *p*-values (full model with *cavg*) whereas the next two columns report only the statistical significant ones (deleting one variable at the time). An improvement in GDP per capita, GDP growth rate, exchange reserves and cumulated current account results in a credit rating upgrade (cumulative current account's significance emerges only during the financial crisis). Notice also the positive impact of World Bank's regulatory quality index; this captures perceptions of the ability of

[3] De Santis (2014) identifies spill-over effects in terms of the direct impact of a Greek credit rating downgrade on other Eurozone sovereign spreads.

the government to formulate and implement sound policies and regulations that permit and promote private sector development.

Our results further suggest that both an increase of the unemployment and inflation rates exert negative impact on credit ratings. We also note (based on the interaction of the post 2008 dummy variable with the regressors) that, for all CRAs, government debt developments and the current account weigh more on credit rating decisions post rather than pre-crisis. For instance, the S&P random effects model suggests that the adverse impact of government debt doubles from an estimate of -0.037 to an estimate of -0.037-0.030=-0.067. The message is very similar from the fixed effects model which is preferred over the random effects one based on the Hausman test (reported at the bottom of the table). Indeed, the fixed effects model suggests, for S&P, an increase in the government debt impact from -0.042 pre-crisis to -0.042-0.024=-0.066 afterwards. Equally important, the adverse impact of government debt on credit rating decisions is stronger for Moody's. Indeed, the fixed effects model (which, based on the Hausman test, is preferred over the random effects one) suggests an increase in the debt impact from -0.040 pre-crisis to -0.040-0.037=-0.077 afterwards. Hence, ceteris paribus, an annual increase in the debt-to-GDP ratio by thirteen percentage points brings about one (≈13*0.077) notch downgrade. In our models, this notch downgrade does not depend on any particular threshold such as the 90% debt-to-GDP ratio that Reinhart and Rogoff (2010) deem to be of threat for the growth prospects of a particular country. To account for this possibility, we re-estimated our models by interacting government debt with a dummy variable taking the value of 1 if debt-to-GDP is higher than 90% (and 0 otherwise). Doing so failed to provide any statistical evidence that CRAs might be more aggressive in downgrading countries faced with debt-to-GDP ratios above the 90% threshold. Further, our point estimates suggest that Moody's places more weight on GDP growth and reserves; this impact does not change pre- or post-crisis. Finally, the impact of the external balance appears largely insignificant (pre- or post-crisis) based on the fixed effects model which is preferred by the data. Table 6, which uses the average rating of the three CRAs as dependent variable, also suggests that the impact of government debt and the current account is stronger post

crisis[4]. Last, but not least, the Pesaran (2004) suggests, for all models in Tables 3-6, no remaining cross-sectional dependence.

Recent research by Livingston *et al*. (2010) finds that, in the case of corporate bond rating decisions, Moody's has become more conservative (in the sense that it gives more inferior ratings) than S&P post-1998 and that investors value "more" decisions made by Moody's than decisions made by S&P. What we find for Eurozone's sovereign bond market is that Moody's appears to be placing more weight (compared with the remaining CRAs) on fiscal stance developments. If, indeed, investors value "more" decisions made by Moody's, our results arguably suggest that any rating upgrades decided by Moody's on fiscal related grounds have the potential of accelerating investor faith in Eurozone's troubled peripheral market (particularly in Greece), therefore triggering a rapid reduction in peripheral sovereign bond yields which remained stubbornly elevated during the (recent) financial crisis.

3. Conclusions

We examine the determinants of credit ratings for the Eurozone countries over the period 2002-2013 in a panel data model which allows for cross-sectional dependence as a form of spill-over effects within Eurozone. Our results suggest that government debt and cumulative current account exert a stronger positive impact on credit ratings post-2008 compared to the period before. Arguably, our model, which allows for cross-sectional dependence and differential impact on credit rating decisions post-2008, could go some way towards shedding some light on how CRAs assign sovereign credit ratings.

[4] In preliminary analysis, we also used the fiscal balance (as % of GDP) as an extra regressor. This consistently entered our models with the wrong (negative) sign; at the same time, the GDP growth coefficient turned statistically insignificant. For this reason, we decided to drop the fiscal balance regressor.

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Table 3: Credit rating models-Fitch

	FITCH											
	Pooled OLS				Fixed Effects				Random Effects			
	coef.	*p* -val	coef.	*p* -val	coef.	*p* -val	coef.	*p* -val	coef.	*p* -val	coef.	*p* -val
Log GDP per capita	10.970	0.000	11.086	0.000	4.039	0.365	8.825	0.017	9.195	0.000	9.370	0.000
Log GDP per capita cavg	-4.644	0.729			5.716	0.589			-1.586	0.874		
GDP growth rate	0.149	0.001	0.149	0.001	0.130	0.000	0.135	0.000	0.152	0.000	0.152	0.000
GDP growth rate cavg	-0.172	0.135	-0.222	0.002	-0.176	0.004	-0.123	0.004	-0.181	0.001	-0.208	0.000
Government Debt	-0.032	0.000	-0.033	0.000	-0.043	0.014	-0.040	0.034	-0.024	0.013	-0.024	0.009
Government Debt cavg	0.301	0.033	0.270	0.002	0.202	0.121	0.111	0.000	0.251	0.033	0.260	0.007
Inflation Rate	-0.281	0.000	-0.287	0.000	-0.107	0.119	-0.154	0.008	-0.177	0.026	-0.179	0.010
Inflation Rate cavg	-0.381	0.251	-0.247	0.127	-0.323	0.202	-0.349	0.007	-0.408	0.040	-0.372	0.037
Unemployment Rate	-0.142	0.000	-0.143	0.000	-0.218	0.004	-0.200	0.009	-0.180	0.001	-0.174	0.001
Unemployment Rate cavg	-0.723	0.297	-0.561	0.085	-0.278	0.649			-0.552	0.336	-0.612	0.118
Current account	-0.013	0.001	-0.013	0.001	0.000	0.985			-0.002	0.735		
Current account cavg	-0.007	0.864			-0.015	0.558			-0.014	0.566		
External Balance	-0.062	0.001	-0.062	0.001	-0.008	0.669			-0.070	0.008	-0.079	0.011
External Balance cavg	-0.667	0.065	-0.758	0.013	-0.642	0.005			-0.630	0.002	-0.675	0.002
Log Reserves	1.439	0.000	1.440	0.000	-0.133	0.568			0.845	0.004	0.951	0.001
Log reserves cavg	-3.421	0.548			-0.955	0.623			-2.527	0.272		
Regulatory Quality	0.165	0.659			1.716	0.003	1.953	0.002	1.022	0.059	0.867	0.115
Regulatory Quality cavg	12.704	0.093	10.963	0.056	8.350	0.115	10.491	0.034	10.791	0.031	10.260	0.021
Government Debt * Dcrisis	-0.036	0.000	-0.036	0.000	-0.027	0.003	-0.024	0.000	-0.034	0.000	-0.034	0.000
Current account * Dcrisis	0.021	0.000	0.022	0.000	0.009	0.248	0.014	0.013	0.012	0.140	0.010	0.043
External Balance * Dcrisis	-0.117	0.000	-0.118	0.000	-0.057	0.074	-0.075	0.009	-0.082	0.004	-0.079	0.001
Constant	-1.107	0.904	-63.166	0.000	-28.989	0.598	-37.046	0.053	-17.393	0.748	-50.247	0.000
* Robust standard erros												
R squared within					0.877		0.853		0.850		0.844	
between					0.377		0.638		0.882		0.896	
overall	0.901		0.901		0.511		0.677		0.872		0.880	
PesaranCross sectional independence test					-1.19	Pr=0.235	1.82	Pr=0.06	-1.37	Pr=0.16	-1.33	Pr=0.18
Hausman Specification Test									54.14	Pr=0.00		

Note: The estimation is carried out in Stata and the robust standard errors are derived using the *vce(robust)* option in Stata.

Table 4: Credit rating models-S&P

	S&P											
	Pooled OLS				Fixed Effects				Random Effects			
	coef.	*p* -val	coef.	*p* -val	coef.	*p* -val	coef.	*p* -val	coef.	*p* -val	coef.	*p* -val
Log GDP per capita	10.601	0.000	10.495	0.000	6.079	0.230	11.657	0.020	10.601	0.000	10.734	0.000
Log GDP per capita cavg	-10.763	0.461			-3.815	0.743			-10.763	0.244		
GDP growth rate	0.131	0.026	0.113	0.049	0.110	0.009	0.113	0.001	0.131	0.012	0.120	0.002
GDP growth rate cavg	-0.132	0.284	-0.260	0.000	-0.130	0.012	-0.213	0.000	-0.132	0.029	-0.215	0.000
Government Debt	-0.035	0.000	-0.039	0.000	-0.045	0.002	-0.042	0.014	-0.035	0.003	-0.037	0.000
Government Debt cavg	0.297	0.033	0.089	0.100	0.220	0.045	0.145	0.000	0.297	0.008	0.141	0.000
Inflation Rate	-0.285	0.000	-0.261	0.000	-0.139	0.019	-0.216	0.000	-0.285	0.001	-0.239	0.000
Inflation Rate cavg	-0.365	0.290			-0.332	0.107			-0.365	0.104		
Unemployment Rate	-0.091	0.009	-0.117	0.001	-0.182	0.001	-0.183	0.006	-0.091	0.087	-0.143	0.000
Unemployment Rate cavg	-0.791	0.274			-0.415	0.410			-0.791	0.131		
Current account	-0.006	0.190			0.000	0.952			-0.006	0.487		
Current account cavg	-0.013	0.765			-0.017	0.584			-0.013	0.680		
External Balance	-0.074	0.000	-0.089	0.000	-0.024	0.311			-0.074	0.017	-0.089	0.000
External Balance cavg	-0.561	0.156	-0.536	0.055	-0.559	0.002	-0.760	0.001	-0.561	0.018	-0.549	0.000
Log Reserves	1.309	0.000	1.257	0.000	-0.345	0.223			1.309	0.000	0.530	0.079
Log reserves cavg	-5.079	0.438			-2.756	0.305			-5.079	0.093		
Regulatory Quality	0.340	0.421			1.138	0.087	1.482	0.045	0.340	0.712		
Regulatory Quality cavg	13.004	0.096			10.245	0.023	9.703	0.007	13.004	0.002	9.627	0.000
Government Debt * Dcrisis	-0.035	0.000	-0.030	0.000	-0.028	0.001	-0.024	0.000	-0.035	0.000	-0.030	0.000
Current account * Dcrisis	0.020	0.000	0.013	0.002	0.010	0.169	0.015	0.012	0.020	0.003	0.012	0.002
External Balance * Dcrisis	-0.095	0.001	-0.070	0.006	-0.033	0.341	-0.053	0.051	-0.095	0.012	-0.045	0.068
Constant	34.773	0.734	-39.781	0.000	21.990	0.677	-49.521	0.040	34.773	0.540	-49.089	0.000
* Robust standard erros												
R squared within					0.883		0.845		0.818		0.859	
between					0.469		0.700		0.919		0.833	
overall	0.890		0.889		0.580		0.706		0.890		0.843	
PesaranCross sectional independence test					-1.47	Pr=0.142	-0.39	Pr=0.69	-1.35	Pr=0.17	-0.29	Pr=0.77
Hausman Specification Test									36.60	Pr=0.00		

Table 5: Credit rating models-Moody's

	MOODYS											
	Pooled OLS				Fixed Effects				Random Effects			
	coef.	*p* -val	coef.	*p* -val	coef.	*p* -val	coef.	*p* -val	coef.	*p* -val	coef.	*p* -val
Log GDP per capita	9.870	0.000	9.909	0.000	-8.231	0.098			8.971	0.000	9.696	0.000
Log GDP per capita cavg	-31.486	0.046	-21.783	0.023	-10.934	0.273	-28.582	0.000	-30.194	0.000	-31.353	0.000
GDP growth rate	0.174	0.002	0.177	0.001	0.144	0.01	0.148	0.005	0.170	0.000	0.170	0.000
GDP growth rate cavg	-0.119	0.347			-0.103	0.044			-0.115	0.058	-0.114	0.064
Government Debt	-0.034	0.000	-0.036	0.000	-0.049	0.024	-0.040	0.037	-0.032	0.000	-0.035	0.000
Government Debt cavg	0.555	0.000	0.450	0.000	0.515	0.001	0.599	0.000	0.532	0.000	0.544	0.000
Inflation Rate	-0.155	0.014	-0.162	0.007	-0.051	0.364			-0.136	0.128	-0.153	0.070
Inflation Rate cavg	-1.059	0.005	-1.327	0.000	-1.063	0.005	-1.385	0.000	-1.049	0.001	-1.055	0.001
Unemployment Rate	-0.112	0.004	-0.114	0.004	-0.308	0.011	-0.265	0.001	-0.145	0.013	-0.150	0.009
Unemployment Rate cavg	-2.179	0.006	-1.541	0.004	-1.814	0.007	-2.277	0.001	-2.089	0.000	-2.114	0.000
Current account	-0.003	0.495			0.007	0.284			0.004	0.573		
Current account cavg	-0.053	0.206			-0.053	0.021	-0.060	0.006	-0.058	0.009	-0.056	0.011
External Balance	-0.087	0.000	-0.094	0.000	-0.030	0.289			-0.103	0.002	-0.096	0.009
External Balance cavg	-0.916	0.015			-0.931	0.000	-0.849	0.002	-0.893	0.000	-0.906	0.000
Log Reserves	1.541	0.000	1.529	0.000	0.125	0.680			1.318	0.000	1.280	0.000
Log reserves cavg	-9.231	0.177	-18.061	0.000	-7.498	0.009	-13.251	0.000	-8.913	0.010	-8.902	0.011
Regulatory Quality	0.241	0.484			2.038	0.000	2.142	0.003	0.686	0.144		
Regulatory Quality cavg	24.522	0.002	32.347	0.000	21.121	0.002	28.056	0.000	23.733	0.000	2.468	0.000
Government Debt * Dcrisis	-0.041	0.000	-0.040	0.000	-0.039	0.002	-0.037	0.000	-0.040	0.000	-0.041	0.000
Current account * Dcrisis	0.018	0.005	0.016	0.004	0.002	0.749	0.013	0.026	0.012	0.074	0.015	0.002
External Balance * Dcrisis	-0.103	0.001	-0.096	0.001	-0.050	0.214	-0.077	0.048	-0.082	0.007	-0.089	0.003
Constant	152.270	0.171	187.996	0.004	141.851	0.009	230.955	0.000	150.616	0.011	152.235	0.011
* Robust standard erros												
R squared within					0.889		0.874		0.849		0.844	
between					0.022		0.193		0.913		0.914	
overall	0.891		0.887		0.082		0.443		0.886		0.885	
PesaranCross sectional independence test					-0.641	Pr=0.521	-0.623	Pr=0.53	-0.791	Pr=0.42	-0.752	Pr=0.42
Hausman Specification Test									46.940	Pr=0.00		

Table 6: Credit rating models-Average Rating

	AvRating											
	Pooled OLS				Fixed Effects				Random Effects			
	coef.	*p* -val	coef.	*p* -val	coef.	*p* -val	coef.	*p* -val	coef.	*p* -val	coef.	*p* -val
Log GDP per capita	10.481	0.000	10.167	0.000	0.629	0.881	2.740	0.504	9.497	0.000	9.934	0.000
Log GDP per capita cavg	-15.631	0.250			-3.011	0.750			-14.005	0.082		
GDP growth rate	0.152	0.003	0.147	0.005	0.128	0.002	0.140	0.000	0.152	0.000	0.141	0.000
GDP growth rate cavg	-0.141	0.215	-0.236	0.001	-0.136	0.004	-0.197	0.000	-0.144	0.005	-0.087	0.020
Government Debt	-0.034	0.000	-0.034	0.000	-0.046	0.004	-0.035	0.035	-0.029	0.001	-0.034	0.000
Government Debt cavg	0.384	0.005	0.278	0.001	0.312	0.010	0.334	0.000	0.354	0.001	0.162	0.000
Inflation Rate	-0.241	0.000	-0.233	0.000	-0.099	0.069	-0.117	0.017	-0.182	0.011	-0.184	0.002
Inflation Rate cavg	-0.602	0.065	-0.320	0.048	-0.572	0.021	-0.539	0.008	-0.619	0.003	-0.577	0.000
Unemployment Rate	-0.115	0.001	-0.118	0.001	-0.236	0.001	-0.254	0.001	0.148	0.002	-0.167	0.000
Unemployment Rate cavg	-1.231	0.071	-0.658	0.041	-0.836	0.115	-0.910	0.009	-1.122	0.022		
Current account	-0.007	0.070			0.002	0.682			0.000	0.936		
Current account cavg	-0.024	0.540			-0.028	0.238			-0.030	0.209		
External Balance	-0.074	0.000	-0.086	0.000	-0.021	0.255			-0.090	0.001	-0.085	0.002
External Balance cavg	-0.715	0.044	-0.794	0.007	-0.711	0.001	-0.900	0.000	-0.687	0.001		
Log Reserves	1.430	0.000	1.406	0.000	-0.118	0.610			1.080	0.000	0.773	0.007
Log reserves cavg	-5.910	0.318			-3.737	0.077			-5.421	0.045	-9.968	0.000
Regulatory Quality	0.249	0.482			1.631	0.001	1.797	0.002	0.763	0.165		
Regulatory Quality cavg	16.743	0.022	13.972	0.012	13.239	0.010	14.429	0.005	15.700	0.001	19.772	0.000
Government Debt * Dcrisis	-0.037	0.000	-0.036	0.000	-0.031	0.001	-0.034	0.000	-0.036	0.000	-0.033	0.000
Current account * Dcrisis	0.020	0.000	0.014	0.002	0.007	0.314	0.012	0.030	0.012	0.061	0.013	0.001
External Balance * Dcrisis	-0.105	0.000	-0.089	0.001	-0.047	0.162	-0.071	0.022	-0.076	0.011	-0.069	0.001
Constant	58.658	0.536	-62.194	0.000	44.950	0.335	-18.289	0.318	55.772	0.268	37.400	0.065
* Robust standard erros												
R squared within					0.905		0.885		0.869		0.867	
between					0.166		0.405		0.906		0.906	
overall	0.905		0.903		0.375		0.565		0.895		0.894	
PesaranCross sectional independence test					-0.722	Pr=0.470	-0.035	Pr=0.97	-0.989	Pr=0.32	1.719	Pr=0.08
Hausman Specification Test									79.340	Pr=0.00		