Does political instability matter for sovereign yield spreads in the Euro area market?

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Abstract: The 2008/2009 global financial crisis had a major impact on the European government bond market. At the dawn of the crisis, after a decade of intra-European integration efforts, yields on sovereign bonds issued by countries from the European Monetary Union (EMU) reached a historical low. This achievement was rapidly annihilated by the deterioration of global market conditions since the collapse of Lehman Brothers in October 2008 and the subsequent reassessment of the creditworthiness of selected Eurozone countries by investors. The current paper investigates the main drivers of sovereign yield spreads of EMU countries with respect to German bonds using quarterly data over the 2002-2017 period, and extends the analysis to include the role of political (in)stability. We employ mainly a dynamic panel method, the pooled mean group estimator of Pesaran, Shin and Smith (1999). Our results reveal that, in addition to fundamentals (GDP growth, large public debt, liquidity, market sentiments, and trade deficit), political risks also put substantial upward pressure on sovereign bond yields.

Keywords: Sovereign bond market, debt, Euro zone crisis, panel models.

JEL Classification: F33, E42, G15

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Introduction

The world economy is struggling to recover from the 2008-2009 global downturn, the harshest financial crisis it faced since the Great Depression of the 1930s. This unprecedented crisis − which started in October 2008 with the collapse of Lehman Brothers − affected gradually most of the countries around the world, and had a particularly strong impact on the government bond market of Eurozone countries. Deteriorating economic prospects, falling commodity prices, growing risk aversion and massive financial stress have raised the concerns of a sharp increase of fiscal deficit and government debt across Europe. The current paper analyses the evolution of sovereign debt in Eurozone countries, focusing on the yields on ten-year maturity sovereign bonds, and aims to identify the main determinants of spreads before and during the crisis.

There is a wide economic literature on the determinants of yields on government bonds and of their spreads against a benchmark country. A central issue closely investigated by this literature is how markets appraise the sovereign default risk. This question was first addressed in the context of emerging countries, which experienced episodes of country default (e.g. Edwards, 1984; Mody, 2009). Later, the analysis was extended to European sovereign bonds (Cordogno et al., 2003; Bernoth et al., 2012; Manganelli and Wolswijk, 2009; Schuknecht, von Hagen and Wolswijk, 2009; Von Hagen, Schuknecht and Wolswijk, 2011; Barbosa and Costa, 2010; Oliveira et al., 2011; Maltritz, 2012). These works were driven partially by the growing interest for understanding the effects of the newly created European monetary union (EMU), and partially by the rapidly deteriorating economic performances of several EMU countries after the outbreak of the financial crisis. Accordingly, some of these studies compare the evolution of yields or spreads on bonds and of their determinants before and after the introduction of the Euro, while others focus on evolutions prior to and during the European sovereign debt crisis. Despite the absence of a common, consistent model identifying the drivers of yields and spreads, the empirical evidence brought by these studies suggests some regularity and uniformity in results. Three main common drivers of bond yields and yield spreads are identified: credit risk factors, market liquidity, and global risk aversion. During the global financial crisis, all these factors were reflected in the yield spreads on sovereign bonds.

A first contribution of the current paper is that, in addition to traditional, fundamental determinants of spread yields (GDP growth, inflation, government debt, liquidity), it considers the role of political (in)stability. This extension of the standard model complements the recent analysis of Aristei and Martelli (2014) pointing to the important role of non-fundamental factors, such as market expectations and behavioral factors. Their results show that the worsening of market sentiments and of investor and consumer confidence was a key determinant of the recent dramatic rise in yield spreads on government bonds in the Euro area. The present paper focuses on a different non-fundamental determinant of spreads, the variable or unpredictable behavior of a country's political institutions. Until recently, this aspect was believed to affect only developing, emerging and transition countries. The deterioration of financial and economic indicators in many European countries, generated by the global financial turmoil and reinforced by the European debt crisis, led to an increase in domestic and European political tensions and has drawn attention to the importance of political cohesion and stability even in this region. Unpopular austerity measures adopted by several European governments over the last four-five years and the limited capacity of governing political parties to handle the crisis and to restore growth and employment caused the premature end of the ruling government and power shifts in half of the Eurozone countries (Greece, Ireland, Italy, Portugal, Spain, Slovenia, Slovakia, and the Netherlands). The falling support for parties that have traditionally dominated national politics and the rise of new political parties resulted in a larger number of governing coalitions and of parties with coalitions. Broad differences in economic and social programs of ruling coalition parties further complicate the European political landscape and reduce the sustainability of these governments. Our analysis aims to determine how political volatility is reflected in the government bond yield spreads of European countries, mainly after the outbreak of the crisis.

Another contribution of our paper is the use of some dynamic panel estimators, which accounts for possible non-stationarity in the data and combines the advantage of heterogeneous effects across countries with that of stable and economically plausible estimates, to investigate the determinants of yield spreads. More precisely, we use the pooled mean group (PMG) estimator developed by Pesaran, Shin and Smith (1999). The vast majority of previous studies employed static panel estimators (SP) with fixed/random effects, or the generalized method of moments (GMM) estimator, most frequently under the form proposed by Arellano and Bond (1991). Static panel models allow for country-level heterogeneity in terms of the level of spreads, but not of slopes (i.e. the explanatory variables' effects on spreads). In addition, their estimates may suffer from endogeneity and omitted variable biases. The GMM estimator aims to solve these problems by taking into account the dynamic dimension of the data. For that, it uses the lags of the dependent and explanatory variables to instrument the contemporaneous effects on spreads. Still, the GMM estimator disregards the non-stationarity of spreads and of their drivers. This aspect is explicitly exploited by the PMG approach, which takes a step forward with respect to the traditional literature on dynamic panels relying on the use of the GMM estimator, by estimating a different slope parameter for each country, and by considering the non-stationarity of variables. Similar to the GMM, the PMG estimator is a dynamic panel model designed to avoid endogeneity, omitted variable issues, and the use of time-invariant country characteristics (fixed effects). A main advantage of the PMG over SP and GMM estimators is that for each explanatory variable it identifies a long-term effect, corresponding to the economic equilibrium or steady state, and a short-term effect, reflecting the adjustment of the current state for reaching the long-term equilibrium. In addition, the PMG estimates the speed of adjustments, i.e. the intertemporal rate for reaching the steady state, the model being valid only in case of convergence (a negative the speed of adjustment). To our knowledge, the literature on spread determinants counts only a handful of studies using the PMG estimator. Ferrucci (2013) and Bellas, Papaioannou and Petrova (2010) adopt this approach to explain the yield spreads of emerging countries. Aristei and Martelli (2014) use the PMG to illustrate the impact on spreads of market sentiments and expectations. The identification of short- and long-run determinants of sovereign bond yields by Pogosyan (2014) concludes this list. For robustness checks, we will propose the dynamic version of the common correlated effects estimator by Chudik and Pesaran (2015) to control for the unobserved dependence between countries (by adding cross-sectional means and lags) as well as for their heterogeneity.

In line with the literature, we assume that bonds issued by Germany are risk-free and compute spreads as the difference between the yields on ten-year government bonds of EMU countries and the remuneration of similar-maturity German bonds. We use quarterly data for an eleven-year period: Q1:2002 to Q1:2017. The large number of time periods justifies the use of a dynamic panel approach, in our case the PMG estimator of Pesaran, Shin and Smith (1999). Unlike previous studies, we consider the full panel of countries that have integrated the Eurozone by 2017. By increasing the number of countries in the analysis, we also increase the variability of explained and explanatory variables, the statistical significance of estimated effects, and the validity of our results. The results suggest that public debts, liquidity, market sentiments, political instability, global financial instability and trade balance put considerable pressure on sovereign bond yields in many euro area economies, and mostly in the long run.

The rest of the paper is structured as follows. The next section describes the empirical specification and reviews the employed data. We briefly discuss the key drivers of spreads on yields of EMU countries' government bonds. In section 3, we present and interpret estimation results. The last section summarizes our main findings and conclusions.

2. Empirical specification and data

2.1. Econometric specification

Firstly, we define spreads as the difference between the yields on ten-year government bonds issued by individual EMU countries and yields on German bonds of equal maturity:

$$Spread_{i,t} = yield_{i,t} - yield_{DEU,t} \qquad (1)$$

Empirical studies discussed in the previous section establish that factors related to country-specific credit risks, liquidity risk, and global market conditions and risks explain a major part of the variance in yield spreads. Based on these findings, we express yield spreads as a function of variables corresponding to each of these three dimensions, to which we add a variable capturing the volatility of the country's political system:

$$Spread_{i,t} = f(credit_{i,t}, liquid_{i,t}, global_t, \mathbf{polit}_{i,t})$$

where $credit_{i,t}$, $liquid_{i,t}$, $global_t$, $\mathbf{polit}_{i,t}$ reflect the credit, liquidity, global, and political risks.

Next, as our empirical analysis aims to disentangle long-run and short-run effects on sovereign yield spreads, we take advantage of the Pooled Mean Group model developed by Pesaran, Shin and Smith (1999). Accordingly, the long-run relationship between spreads on government bond yields ($spread_{i,t}$) and their determinants write as follows:

$$spread_{i,t} = \theta_i + \boldsymbol{\alpha}_i^T \mathbf{credit}_{i,t} + \boldsymbol{\beta}_i^T \mathbf{liquid}_{i,t} + \boldsymbol{\gamma}_i^T \mathbf{global}_t + \boldsymbol{\delta}_i^T \mathbf{polit}_{i,t} + \varepsilon_{i,t} \qquad (1)$$

Subscripts i and t denote the country and the time period. θ_i are country-specific intercepts and $\varepsilon_{i,t}$ are the error terms. In equation (1), explanatory variables reflecting credit, liquidity, and global risks are grouped in three vectors: $\mathbf{credit}_{i,t}$, $\mathbf{liquid}_{i,t}$, $\mathbf{global}_t$. $\boldsymbol{\alpha}_i^T$, $\boldsymbol{\beta}_i^T$, and $\boldsymbol{\gamma}_i^T$ are the transposed vectors of associated coefficients, which are allowed to vary across countries. Vector $\mathbf{polit}_{i,t}$ refers to variables measuring the level of political stability. These variables may also affect differently each country in the panel, yielding country-specific estimates for each element of coefficients vector $\boldsymbol{\delta}_i$. In line with the literature, we use GDP growth, inflation rate, VIX, for global financial instability, external balance, real effective exchange rate, liquidity for EMU16 government debt, and public deficit as factors shaping the country-specific credit risks. Market liquidity is measured by the country's government debt expressed a percentage share of the overall debt of all EMU countries. We use the real effective exchange rate and the trade balance as additional country-specific controls. To capture global market conditions and risks common to all Eurozone countries, we use the risk premiums of BBB-rated US corporate bonds and the stock market volatility index (VIX).

We extend the model expressed by equation (1) to a dynamic panel specification by including p lags of our dependent variable and q lags of independent RHS variables. The resulting autoregressive distributed lags (ARDL(p,q)) specification is:

$$spread_{i,t} = \theta_i + \sum_{j=1}^{p} \lambda_{ij}\, spread_{i,t-j} + \sum_{j=0}^{q} \boldsymbol{\alpha}_{ij}^{T}\, \mathbf{credit}_{i,t-j} + \sum_{j=0}^{q} \boldsymbol{\beta}_{ij}^{T}\, \mathbf{liquid}_{i,t-j} + \sum_{j=0}^{q} \boldsymbol{\gamma}_{ij}^{T}\, \mathbf{global}_{t-j} + \sum_{j=0}^{q} \boldsymbol{\delta}_{ij}^{T}\, \mathbf{polit}_{i,t} + e_{i,t} \quad (2)$$

By shifting the first lag of spreads ($spread_{i,t-1}$) to the left hand side of the equation sign and rearranging the other RHS terms of equation (2), we obtain the following error correction equilibrium model:

$$\Delta spread_{i,t} = \varphi_i \left[spread_{i,t-1} - \bar{\boldsymbol{\alpha}}_{i}^{T}\, \mathbf{credit}_{i,t} - \bar{\boldsymbol{\beta}}_{i}^{T}\, \mathbf{liquid}_{i,t} - \bar{\boldsymbol{\gamma}}_{i}^{T}\, \mathbf{global}_{t} - \bar{\boldsymbol{\delta}}_{ij}^{T}\, \mathbf{polit}_{i,t} \right] + \sum_{j=1}^{p-1} \lambda_{ij}^{*}\, \Delta\, spread_{i,t-j} + \sum_{j=0}^{q-1} \tilde{\boldsymbol{\alpha}}_{ij}^{T} \Delta\, \mathbf{credit}_{i,t-j} + \sum_{j=0}^{q-1} \tilde{\boldsymbol{\beta}}_{ij}^{T}\, \Delta\, \mathbf{liquid}_{i,t-j} + \sum_{j=0}^{q-1} \tilde{\boldsymbol{\gamma}}_{ij}^{T} \Delta\, \mathbf{global}_{t-j} + \sum_{j=0}^{q-1} \tilde{\boldsymbol{\delta}}_{ij}^{T}\, \Delta\, \mathbf{polit}_{i,t} + \theta_i + e_{i,t} \quad (3)$$

where Δx represents the change in variable x: $\Delta x_{i,t} = x_{i,t} - x_{i,t-1}$; $\Delta x_{i,t-q+1} = x_{i,t-q+1} - x_{i,t-q}$. This procedure permits to distinguish the long-run and short-run effects on spreads of each variable in the model. The terms in brackets describe the long-term relationship, and parameters φ_i represent the country-specific speeds of adjustments to the long-term equilibrium. The statistical significance of φ_i confirms the presence of this equilibrium for country i, and a negative estimated values of φ_i indicates that the system converges to its steady state after a shock. Bar superscripts designate the response of spreads to changes in credit, liquidity, global, and political risks on the long run, while tilde superscripts reflect the generated short-term variations of spreads.

The PMG approach consists in estimating equation (3) under the assumption of identical long-term coefficients for all countries: $\bar{\boldsymbol{\alpha}}_{i}^{T} = \bar{\boldsymbol{\alpha}}^{T}$, $\bar{\boldsymbol{\beta}}_{i}^{T} = \bar{\boldsymbol{\beta}}^{T}$, $\bar{\boldsymbol{\gamma}}_{i}^{T} = \bar{\boldsymbol{\gamma}}^{T}$, $\bar{\boldsymbol{\delta}}_{i}^{T} = \bar{\boldsymbol{\delta}}^{T}$, $\forall i$. The identification of all parameters of (3) is possible due to the non-linearity of the model and the identities holding between the parameters in equations (2) and (3). Based on the Akaike criterion, the PMG models estimated in the next section includes 2 until 4 lags for each variable: $p = q = \overline{2,4}$[3]

2. Variables and data

To study the main determinants of spreads on bond yields, we consider both time and cross-country variation in the data. Our data sample covers the sixteen Euro area countries and the

[3] Please refer to Pesaran, Shin and Smith (1999) for details.

period Q1:2002 to Q4:2017.[4] To increase the number of time periods in our estimations, we use quarterly data.[5] This frequency also permits to account quite accurately for the breakout of the financial crisis (Q3/Q4:2008), how it affected the evolution of spreads and the impact on spreads of different variables. The dummy variable « crisis » embodies currency crisis, banking crisis, debt crisis and stock market craches during the studied period according to the Reinhart (2018) crisis classification. To capture the global financial risks, we use the stock market volatility index (VIX, as a common proxy for international financial instability, Mody, 2009).

We compute the spreads on government bonds as the difference between the yields on 10-year bonds issued by each country in our panel and the yields on German bonds. We employ monthly data provided by the European Central Bank (ECB) to compute quarterly averages. Data on GDP growth, inflation, government debt, and budget balance (deficit or surplus) comes from the Eurostat and is in quarterly frequency. The last two variables are expressed in percentage of quarterly GDP. Similar to Bernoth et al. (2012) and Maltritz (2011), we use the share of countries' government debt in the overall EMU debt to measure market liquidity.

Real effective exchange rate (REER) and trade balance are obtained using the Eurostat monthly data. In the absence of aggregate price data on imported and exported goods, we integrate real effective exchange rate index of EMU_16 countries as a measure of country's competitivness. Resulting ratios are converted from monthly to quarterly frequency by taking simple averages across the months of each quarter. The trade balance is computed from monthly values of exports and imports of goods and services, aggregated by quarters. To eliminate the correlation with country size, trade balance is expressed as percentage of quarterly GDP.

We use the yield spreads on BBB-rated US corporate bonds relative to US treasury bonds to capture the global liquidity conditions and risks faced by all EMU countries. Data on both variables comes from Datastream, and monthly series are transformed into quarterly.

To assess countries' political stability, we use the Political Stability and Absence of Violence/Terrorism ranking indicator from the World Bank database Worldwide Governance Indicators (WGI), computed by Kaufman, Kraay and Mastruzzi (2010). This indicator measures the perceptions of the likelihood of the government to be destabilized or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism. It corresponds to the percentile rank among all world countries and ranges from 0 (lowest) to 100 (highest) rank or political stability. This is a direct measure of political insecurity and an inverse measure of political risk. We use two other measures of political risk based on the results of parliamentary/presidential elections in each country from the European Elections Database (EED) published by the Norwegian Social Science Data Services.[6] We compute the following variables: (i) the percentage of direct votes obtained by the first-run party in the last presidential elections (Presidential vote wining election) and (ii) the voter turnout which is the percentage of eligible voters who cast a ballot in an presidential election (VT, this variable will not be finally integrated in the models). These two variables are direct measures of political stability: the higher the support obtained by the first-run party, the easier it will confront the opposition and

[4] We exclude Estonia because this country did not issue comparable long-term sovereign debt securities during the analyzed period. Latvia is not included in the sample because it is not an euro area member during the sample period considered. German bonds are used as reference. This reduces our sample to fifteen countries.

[5] The analysis cannot be run on monthly data because many fundamental explanatory variables, including the GDP, are computed only at quarterly and annual frequency.

[6] http://www.nsd.uib.no/european_election_database/about/

implement its program(s). Variables reflecting the political (in)stability come in a lower frequency than the rest of variables in the data. We also integrate separately other political measures coming from the Manifesto Project Dataset on the results of parliamentary elections, version 2017b, accessed on https://manifesto-project.wzb.eu/datasets. Missing data for Malta and for most recent elections (2014-2017) in other 14 EU countries were filled in using the results of each election found on the web page of each country's central election body. We used the political composition of each country's parliament in each time period to compute two political variables: (1) the percentage of votes obtained by the party with the largest votes; (2) the percentage of parliament seats hold by the party with the largest votes; For countries with a bicameral parliament, votes in the lower house/assembly were considered. When computing these variables, we control for the change in the total number of parliament seats that occurred in some EU countries. A larger share of votes or parliament seats for the party that gained the elections indicates a lower need to associate with other parties to form a ruling government and a higher probability to pass its economic policies, and is therefore associated with a higher political stability. Similarly, a lower number of parties to form a majority points to a higher political stability. A large number of parties in the parliament may suggest a higher level of democracy, but reveals a high fragmentation of political power, decisions (via majority or consensus) being more difficultly reached. Accordingly, we associate a larger number of parties with political instability. We also integrate the Gini coefficient computed using the percentage of seats in parliament as an indicator of political stability. Indeed, a large Gini coefficient indicates that the first-run party holds a comfortable majority in the parliament, permitting it to implement more easily its own economic policies (facing less opposition from other parties). This implies more predictable economic policies (lower uncertainty) and should reduce bond yield spreads.

Unlike the spread and the Gini coefficient, explanatory variables are expressed in levels rather than as differences with respect to Germany. This approach implicitly assumes that the benchmark country is virtually considered as free of default risk, or at least that the German bond yield is a good estimate for a riskless interest rate (Maltritz, 2011). All models include dummies for each two-year period (namely, 2002-2004 ; 2005-2007, 2008-2010, 2011-2013, 2014-2016) to account for differences in the level of spreads during the financial crisis periods and to control for error cross-sectional dependence (in these sense, we also apply second-generation panel unit root tests and cointegration tests).

3. Results and discussions

3.1. Cross-sectional dependence, stationarity, and cointegration

Before turning to estimations, we check the stationarity and cointegration of our variables, under cross-sectional dependence, using different panel unit root and cointegration tests. The results (upon request) indicate that all variables are integrated of order one and are cointegrated. Since our panel combines both stationary and non-stationary data, we can confidently use an error correction framework to evaluate the drivers of yield spreads. The table 1 gives the correlation matrix between our independent variables. It indicates that there is no correlation between them.

3.2. Estimation results

We estimate the PMG model for the entire period and for 16 EMU countries[7] and display results in the Table 2. The first model (1) is our benchmark model ; the next collumns include separately our political measures and different explanatory variables provided by the existing empirical literature. The first key driver of the bond spread we include in the models is the GDP growth. It captures the state of the economy and is supposed to have a negative influence on spreads. Theoretical works on the sustainability of a country's debt (e.g. Domar, 1950) highlight the link between economic growth and debt growth and show that growing economies are more able to fulfill their financial obligations than stagnating economies. In all estimations, the GDP growth coefficient is negative and significant (at 1% and 10% significance level) in the long-run and some-times in the short-run meaning that the state of the economy is a key indicator for the financial markets since expanding economies are more able to respect their payment obligations.

Inflation influences economic activity but may also impact spreads. Higher price differentials lead to losses in competitiveness, mainly for countries that lack an independent monetary policy, such as the ones using pegged currencies, increasing the default risks. Furthermore, countries with a history of high inflation rates achieve easier low inflation rates by integrating a monetary union. The inflation coefficients affect positively the spreads only in the short-run confirming the theoretical prediction that, for countries without an independent monetary policy, high price differentials lead to losses in competitiveness, which increases the default risk. In the long-run, almost all estimates indicate a negative effect on spreads perhaps justified by the quantitative easing policies in place.

The liquidity indicator measures the access to credit relative to total euro area liquidity and is proportional to the size of the country. Effects on yield spreads are negative and statistically significant in the long-run. The result that is in line with recent findings such as: Manganelli and Wolswijk (2009), Haugh et al (2009). The stock market volatility index (VIX) raises the default risks faced by EMU countries, both in the long-run and short-run, in almost all specifications.

The total government debt to GDP ratio increases significantly (at the 1% and 5% levels) the spreads in the long-run. The high absolute value of this effect for EMU countries confirms that the level of debt is an essential component of the risk premium, incorporated in sovereign bond yields. Furthermore, the fiscal performance of the economy is captured by the government's budget balance. Large fiscal deficits over a long period amplify the default risk and positively affect spreads. In general, these effects are not statistically significant in the short-run. According to the literature, a high surplus (financing capacity) or a low deficit (financing needs) depict a stronger capability of the country to honor payments on issued bonds and keeps the cost of sovereign debt (yields on new bonds) down, close to the free-risk reference.

The market (investor) sentiment (captured by BBB-rated US corporate bonds spread to US treasury bonds) is significant in the long-and short-run horizons and may influence the market perception of default risk and spreads (Maltritz, 2011). High corporate spreads indicate that market participants are reluctant to invest in risky bonds and pay lower bond prices. Therefore,

[7] Before discriminating between the long-run and short-run effects on spreads, we also test the usefulness of the PMG model against the MG model (mean group model) by using the Hausman test. Results are available upon request and show that the PMG estimates are more efficient.

higher corporate bond spreads indicate a higher sovereign yield spread. The increase of the real exchange rate (so, its appreciation) increase the defaut risks in euro area countries. This translates into lesser revenues from exports, which diminishes the country's capacity to honor (pay) its foreign debt and debt service. Overall, this leads to higher yields and spreads. A larger trade balance also reflects larger revenues from exporting and has a similar effect on yields and spreads. The long-run estimated coefficients of this estimation are statistically significant in almost all estimations.

We also find that the selected political stability measures reduces the cost differential on new bonds, this effect is particularly significant at the 1% level on the long-run for the all considered models. The political stability index, the percentage of parliament seats hold by the party with the largest votes and the percentage of presidential votes of the wining candidate translates in lower yields and spreads in the euro area countries. The results also suggest that political stability variable has a negative long-run impact (model 7) on the bond yield spreads and diminishes the default risk. A larger share of votes (Polrisk 2 and Presidential vote) obtained by the party with the largest votes indicates a lower need to associate with other parties to form a ruling government and a higher probability to pass its own economic policies. The Gini coefficient computed using the percentage of seats in parliament as an indicator of political stability has a negative short-run impact on the yield spreads suggesting that the first-run party holds, at least in the short-run, a comfortable majority that allows implementing more easily the economic policies of the party (facing less opposition from other parties). This implies more predictable economic policies (lower uncertainty) and reduce bond yield spreads.

A robustness check analysis will be done by using the Chudik and Pesaran (2015) methodology to control for the unobserved dependence between countries (by adding cross-sectional means and lags) as well as for their heterogeneity..

4. Conclusions

This paper identifies the key drivers of sovereign bond spreads in EMU countries from an ex-post perspective. We ask what proportion of the change in market spreads is explained by changes in the underlying fundamentals, external factors, liquidity and market risk. To answer these questions we use a data panel of 16 EMU countries (all EMU countries except Estonia because of the data availability) from 2002 to 2017 and estimate an empirical model in which spreads to Germany on ten-year government bonds are explained by a set of variables including the political risk perceptions, and traditional determinants of spreads, such as GDP growth, inflation, debt, liquidity, financial risks, market sentiments and fiscal measures.

Our analysis overcomes two drawbacks of traditional dynamic panel-data approaches: a single intercept and the homogeneity of slope parameters (i.e. of effects across countries). The main advantage of this approach is that it estimates a different slope parameter for each country, and allows for the non-stationarity of variables.

The data suggests the use of a pooled mean estimator. We find significant effects for almost all variables, in line with theoretical predictions. According to our results, the government debt, the real exchange rate, trade balance, the financial risks, the market behaviour, the liquidity and the political stability measures have the strongest statistically significant impact (particularly in the long-run) on the yield spreads of EMU countries.

Table 2: Determinants of sovereign bond yield spreads: 2002-2017.

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Long-run coeff.	*EMU_16*		*EMU_16*		*EMU_16*		*EMU_16*	*EMU_16*	
GDP growth	-0.269***	-0.235*	-0.262***	-0.269***	-0.258***	-0.259***	-0.219***	-0. 305***	-0.251***
	(0.056)	(0.125)	(0.057)	(0.055)	(0.055)	(0.055)	(0.060)	(0.073)	(0.057)
Inflation	-0.723***	0.34*	-0.769***	-0.721***	-0.730***	-0.604***	-0.601***	-0.897***	-0.585***
	(0.139)	(0.19)	(0.145)	(0.138)	(0.138)	(0.142)	(0.140)	(0.186)	(0.139)
Central Gov. Debt	1.293**	0.11	1.212**	1.341**	1.379***	1.239**	1.458***	1.729**	1.789***
	(0.539)	(0.57)	(0.556)	(0.552)	(0.532)	(0.557)	(0.558)	(0.729)	(0.524)
Liquidity	-11.267***	0.34**[a]	-10.012***	-10.610***	-11.343***	-10.350***	-7.479***	-14.237***	-7.659***
	(2.205)	(0.14)	(2.198)	(2.298)	(2.450)	(2.177)	(2.177)	(2.949)	(2.292)
Budget balance	-0.166**	-0.55*[b]	-0.194***	-0.177***	-0.162**	-0.176***	-0.152**	-0.153*	-0.153**
	(0.070)	(0.21)	(0.069)	(0.069)	(0.069)	(0.069)	(0.066)	(0.083)	(0.069)
REER	15.490***	1.43	11.897***	13.802***	15.070***	14.589***	22.965***	30.563***	20.214***
	(5.357)	(1.94)	(4.579)	(5.010)	(5.339)	(5.502)	(4.611)	(7.133)	(4.896)
VIX	0.464*	2.77***	0.477*	0.510*	0.449*	0.396	0.700***	1.165***	0.576**
	(0.281)	(0.64)	(0.289)	(0.283)	(0.279)	(0.269)	(0.279)	(0.402)	(0.280)
Ext. Balance	-0.062	-0.80***	-0.094*	-0.041	-0.061	-0.050	-0.085*	-0.176***	-0.055
	(0.057)	(0.24)	(0.057)	(0.055)	(0.058)	(0.055)	(0.052)	(0.066)	(0.054)
Market sentiment	-	-0.80***	-	-	-	-			-
		(0.24)					-0.432***	-	-0.268***
Crisis* Deficit	-	-	-	-	-	-	(0.105)		(0.094)
Political Stability			-0.618				-2.942***	-	-
			(0.878)	-	-	-	(1.097)		
									-
Presidential vote			-	-6.073***	-	-	-	-	
				(1.701)					

Long-run coeff	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Political Risk1	-	-	-	-	-0.286		-	-	-
					(0.692)				
Political Risk2	-	-	-	-	-	0.127**	-	-1.909*	-
						(0.060)		(1.079)	
Gini_Pol. Risk2	-	-	-	-	-	-	-	-	1.194
									(2.503)
Error correction coefficient	-0.171***	-0.074***	-0.169**	-0.167*	-0.173***	-0.178***	-0.166***	-0.156***	-0.171**
	(0.043)	(0.022)	(0.044)	(0.042)	(0.043)	(0.044)	(0.041)	(0.042)	(0.040)
Short -run coeff.									
∆ $Spread_{t-1}$	0.353***	-0.266***	0.341***	0.348***	0.362***	0.349***	0.338***	0.371***	0.347***
	(0.057)	(0.045)	(0.059)	(0.059)	(0.053)	(0.056)	(0.054)	(0.052)	(0.053)
∆ $Spread_{t-2}$	-0.087**	-	-0.084*	-0.092**	-0.09**	-0.082**	-0.085**	-0.148**	-0.093***
	(0.042)		(0.044)	(0.041)	(0.053)	(0.043)	(0.041)	(0.034)	(0.037)
∆ $Spread_{t-3}$	0.139***	-	0.132***	0.141**	0.146***	0.136***	0.161***	0.178***	0.171***
	(0.049)		(0.048)	(0.050)	(0.051)	(0.050)	(0.050)	(0.050)	(0.049)
∆ GDP growth	-0.018	-0.01	-0.017	-0.015	-0.019	-0.021	-0.017*	-0.004	-0.015
	(0.016)	(0.01)	(0.016)	(0.014)	(0.017)	(0.018)	(0.010)	(0.010)	(0.011)
∆ Inflation	0.415***	0.17**	0.427***	0.414***	0.410***	0.382***	0.418***	0.382***	0.395***
	(0.089)	(0.08)	(0.094)	(0.088)	(0.090)	(0.090)	(0.091)	(0.082)	(0.084)
∆ Gov. debt	-0.669	-0.51	-0.838	-0.768	-0.826	-0.832	-0.815	-1.569	-0.786
	(1.127)	(0.94)	(1.56)	(1.110)	(1.132)	(1.140)	(1.146)	(1.369)	(1.199)
∆ Liquidity	-7.113	-0.06	-4.439	-8.706*	-7.293*	-9.442**	-6.219	-8.968	-9.239**
	(4.590)	(0.05)	(5.156)	(4.647)	(4.310)	(4.945)	(4.940)	(5.858)	(4.778)
∆ Budget balance	-0.016	0.014	0.015	-	-0.018	-0.0123	-0.022	-0.022	-0.020
	(0.029)	(0.02)	(0.029)		(0.030)	(0.029)	(0.027)	(0.031)	(0.028)
∆ REER	-0.858	-3.30	-0.602	-2.621	-0.915	-1.180	-0.789	-5.203	-0.907
	(4.336)	(2.75)	(4.275)	(2.956)	(4.386)	(4.872)	(3.755)	(3.318)	(4.002)
∆ VIX	0.107	0.08	0.125*	0.103	0.101	0.106*	0.145**	0.075*	0.114*
	(0.068)	(0.06)	(0.068)	(0.067)	(0.068)	(0.065)	(0.060)	(0.088)	(0.067)
∆ Ext. Balance							0.02 (0.03)	0.031*(0.016)	0.004 (0.02)
	-		-	-	-	-	-	-	-

∆ Market sentiment		0.02							
		(0.03)							
∆ Crisis*Deficit		-	-	-	-	-	-0.087*	-	-0.069
							(0.049)		(0.048)
∆ Political Stability		-	0.566*				-0.030		
			(0.302)				(0.243)		-
∆ Presid. Votes	-	-	-	1.054	-	-	-	-	
				(1.097)					
∆ Political Risk1	-	-	-	-	-0.291	-	-	-	-
					(0.329)				
∆ Political Risk2	-	-	-	-	-	0.178	-	-0.462	-
						(0.03)		(0.534)	
∆ Gini_Pol. Risk2	-	-	-	-	-	-	-	-	-5.954**
									(3.048)
∆ Dummy 2002-2004	0.189***	-	0.183***	0.194***	0.194***	0.202***	0.258***	0.192***	0.190***
	(0.059)		(0.02)	(0.058)	(0.059)	(0.061)	(0.064)	(0.068)	(0.057)
∆ Dummy 2005-2007	0.062	-	0.072	0.040	0.080	-0.059	0.108	0.104	0.127
	(0.076)		(0.082)	(0.055)	(0.076)	(0.066)	(0.096)	(0.072)	(0.103)
∆ Dummy 2008-2010	-0.173***	-	-0.170***	-0.166***	-0.168***	-0.194*	-0.192***	-0.117	-0.178**
	(0.058)		(0.063)	(0.057)	(0.057)	(0.103)	(0.076)	(0.118)	(0.073)
∆ Dummy 2011-2013	-0.579***	-	-0.620***	-0.553***	-0.569***	-0.599***	-0.665***	-0.703***	-0.634***
	(0.134)		(0.128)	(0.136)	(0.138)	(0.212)	(0.143)	(0.139)	(0.156)
∆ Dummy 2014-2016	-0.511***	-	-0.528***	-0.508***	-0.492***	0.427	-0.648***	-0.562***	-0.594***
	(0.106)		(0.104)	(0.111)	(0.108)	(0.931)	(0.131)	(0.140)	(0.134)
Intercept	-3.645***	-0.928***	-4.491***	-2.018***	-3.193**	-3.907***	-10.068***	-11.478***	-10.612***
	(0.875)	(0.259)	(1.114)	(0.477)	(0.761)	(0.933)	(2.512)	(3.045)	(2.486)
Trend	-0.0065***	-	-0.007***	-0.006*	-0.006**	-0.003	-0.011***	-0.004	-0.009***
	(0.0026)		(0.003)	(0.002)	(0.003)	(0.0025)	(0.004)	(0.003)	(0.003)
No. Inc. Obs.(N x T)	960	992	960	960	960	960	1020	870	1020
No. Countries	16	16	16	16	16	16	16	16	16
Log. likelyhood	99.644	-45.331	111.112	118.132	113.149	117.231	79.702	142.233	81.482

Notes: The explained variable is expressed as change with respect to yields on German bonds. PMG estimators with ARDL (4,1,1,1,1,1,1,1.1) globally. Standard errors in parentheses. All equations include a constant country-specific term and trend significant. Variables are in natural logarithms (except for the spreads). * p<0.10, ** p<0.05, *** p<0.01. a, b means that the model (2) integrates two interaction terms: the first one, between the liquidity and a crisis dummy and the second one is formed by the central government deficit and the euro area membership dummy.

Table 1 : Matrix correlation of independent variables

Indep. Variables	GDP growth	Inflation	Gov. Debt	Liquidity_EMU 17	Budget deficit	REER	VIX	Ext Balance	Market sentiment	POL_STAB	POLRISK1	POLRISK2	PRESID_VOTES	CRISIS_DEBT	CRISIS_DEFICIT
GDPr growth	1,00														
Inflation	-0,17	1,00													
Gov. Debt	-0,11	-0,29	1,00												
Liquidity_EMU 17	-0,02	-0,03	0,35	1,00											
Budget deficit	0,23	0,02	-0,33	-0,06	1,00										
REER	-0,07	-0,14	0,12	-0,05	0,05	1,00									
VIX	-0,38	0,24	-0,09	0,02	-0,21	0,00	1,00								
Ext Balance	0,08	-0,20	-0,21	-0,20	0,26	0,34	-0,10	1,00							
Market sentiment	-0,14	0,05	-0,05	0,01	-0,12	0,04	0,39	-0,07	1,00						
POL_STAB	0,13	0,12	-0,43	-0,08	0,22	0,09	0,04	0,41	0,00	1,00					
POLRISK1	-0,02	0,03	0,04	0,19	-0,16	0,12	0,03	-0,09	0,01	-0,09	1,00				
POLRISK2	-0,15	0,36	-0,04	0,04	-0,14	-0,02	0,31	-0,10	0,12	0,02	0,28	1,00			
POLRISK3	-0,02	0,07	-0,07	-0,20	0,09	-0,17	0,06	-0,05	0,05	-0,02	-0,83	-0,17			
POLRISK4	0,02	-0,03	-0,14	-0,10	0,19	-0,08	-0,02	0,16	0,00	0,12	-0,80	-0,23			
POLRISK5	0,00	-0,14	0,08	-0,14	0,08	0,02	-0,11	0,05	-0,05	-0,33	-0,59	-0,18			
PRESID_VOTES	-0,04	-0,02	0,20	0,31	-0,22	-0,06	0,00	-0,31	-0,01	-0,19	0,46	-0,05	1,00		
CRISIS_DEBT	-0,25	0,07	0,09	-0,01	-0,17	0,08	0,29	-0,14	0,32	-0,16	0,09	0,25	-0,01	1,00	
CRISIS_DEFICIT	0,24	0,04	-0,18	-0,04	0,42	-0,05	-0,26	0,19	-0,27	0,22	-0,15	-0,17	-0,08	-0,71	1,00

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