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EMU and European government bond market integration

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ABSTRACT

In this study we adopt the CAPM-based model of Bekaert and Harvey (1995) to compare the differences in the relative importance of two sources of systemic risk (world and Eurozone) on Government bond returns, in two groups of countries in EU-15. Results show that euro markets are less vulnerable to the influence of world risk factors, and more vulnerable to EMU risk factors. However, they are only partially integrated. For their part, the markets of the countries that decided to stay out of the Monetary Union present a higher vulnerability to external risk factors.

1. Introduction

The market capitalization of international bond markets is much larger than that of international equity markets. However, compared to the large body of the literature on international equity market linkages (see Bessler and Yang (2003), among others) few empirical studies have been carried out of bond systemic risk or international bond market co-movements. The extent of international bond market linkages merits investigation, as it may have important implications for the cost of financing fiscal deficit, monetary policymaking independence, modelling and forecasting long-term interest rates, and bond portfolio diversification. Conversely, more has been written on emerging countries, where a very important question in the study of yield co-movements is the analysis of the relative influence of fundamental variables on their behaviour (see Cifarelli and Paladino, 2006), and on volatility spillovers in international bond markets (see Cappiello et al. (2003), Christiansen (2007), Skintzi and Refenes (2006), or Panchenko and Wub (2009) among others).

Little has been written on the sources of co-movements in Government bond markets in the European context.[1] Studies of this issue include Geyer et al. (2004), Gómez-Puig (2009a,b), and Pagano and Von Thadden (2004). The aim and methodology of the present paper are completely different from those of the studies just mentioned. Here, we study financial integration, exploiting the implications of asset pricing models. In particular, following Barr and Priestley (2004) who assess the degree of integration of the US, UK, Japan, Germany and Canada bond markets, we adopt Bekaert and Harvey's CAPM-based model (1995). This model allows partially integrated markets and still has not been used to study bond markets integration in the European context. Moreover, it has only been used to analyse the impact of one kind of common or systemic risk factor over bond or stock returns behaviour (see Hardouvelis et al. (2006, 2007)).

Ten years after the introduction of the euro, the aim of this paper is to compare the differences in the relative importance of two sources of systemic risk (world and Eurozone risk) on Government bond returns since January 1999. The model used in this paper draws on Barr and Priestley (2004), but goes beyond it. As far as we know, this is the first empirical study that applies this methodology to analyse the impact of the euro on European Government bond markets integration with a weekly dataset that covers almost ten years since the introduction of the common currency.

The main objective of this paper is to study whether the introduction of the euro had an impact on the degree of integration of European Government bond markets. Therefore, we will carry out a comparative analysis of the degree of integration of Government bond markets in two groups of EU-15 countries: those that

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[1] Kim et al. (2005), Bartram et al. (2007) and Christiansen and Ranaldo (2009) among others analyse European stock market integration.

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joined the European Monetary Union (EMU) and those that stayed out. Our sample will span the period since the beginning of Currency Union until June 2008. Our intention is to separate each individual country's Government bond return into three effects: a local (own country) effect, a regional (Eurozone) effect, and a global (world) effect, and to establish whether there are significant differences between EMU and non-EMU participating countries. That is, we analyse whether participation in the Monetary Union is an important factor which determines the differences in the impact of world and regional risk on each EU-15 Government bond market.

The rest of the paper is organized as follows. Section 2 summarizes the related literature. The model is explained in Section 3. The instrumental variables and data are described in Section 4. Section 5 reports the results and, finally, Section 6 draws the main conclusions.

2. Related literature

Some recent literature has assessed the relative importance of systemic and idiosyncratic risk in EMU sovereign yield spreads (see Geyer et al. (2004), Gómez-Puig (2009a,b) or Pagano and von Thadden (2004)). Geyer et al. (2004) estimate a multi-issuer state-space version of the Cox et al. (1985) model of the evolution of bond-yield spreads (over Germany) for four EMU countries (Austria, Belgium, Italy and Spain). Their main findings are that (i) one single ("global") factor explains a large part of the movement of all four processes, (ii) idiosyncratic country factors have hardly any explanatory power, and (iii) the variation in the single global factor can be explained, to a limited extent, by EMU corporate bond risk, but by nothing else. The most striking finding of the Geyer et al. study is the virtual absence of country-specific yield spread risk. Pagano and von Thadden (2004), despite the considerable differences in the methodology and data used, also agree that yield differentials under EMU are driven mainly by a common risk (default) factor and suggest that liquidity differences have at best a minor role in the time-series behaviour of yield spreads. Gómez-Puig (2009a,b) estimates panel regressions for two groups of EU-15 countries (EMU and non-EMU) including both domestic (differences in market liquidity and credit risk) and international risk factors. Her results present evidence that it is domestic rather than international risk factors that mostly drive the evolution of 10-year yield spread differentials over Germany in all EMU countries during the seven years after the beginning of Monetary Integration. Conversely, in the case of non-EMU countries, adjusted yield spreads are influenced more by world risk factors. The fact that these countries do not share a common Monetary Policy might explain these results, which may also show that government bonds from EMU countries have a better safe-haven status than those of non-EMU countries. These results are consistent with the empirical evidence presented by other authors like Cappiello et al. (2006), who used a completely different methodology to investigate whether the introduction of the euro had an impact on the degree of integration of European financial markets. Controlling for the impact of global factors, they document an overall increase in co-movements in euro area financial markets, especially in bond markets, suggesting that integration in the euro area has progressed since the introduction of the single currency. In contrast to previous studies, they propose two methodologies to measure integration: one that relies on time-varying GARCH correlations, and the other on a regression quantile-based co-dependence measure (see Cappiello et al., 2005).

Another perspective is given by Christiansen (2007), who assesses volatility spillovers in European bond markets. She finds strong evidence of volatility spillover effects from both the US and Europe into individual European bond markets. For EMU countries, regional effects have become dominant over both own country and global effects. The opposite applies to non-EMU countries where pure local volatility effects are substantial.

Finally, a number of papers have studied financial integration exploiting the implications of asset pricing models. The works by Barr and Priestley (2004) and Hardouvelis et al. (2006, 2007) are in this vein. In particular, Barr and Priestley (2004) use a version of Bekaert and Harvey's (1995) CAPM-based model to analyse the degree of integration of the US, UK, Japan, Germany and Canada bond markets, and find strong evidence that national markets are only partially integrated into world markets. Around one quarter of total expected excess returns is related to local market risk, the remainder being due to world bond market risk. A similar methodology is used by Hardouvelis et al. (2006, 2007) to analyse the impact of EMU on European stock market integration. They present evidence linking the process of increased integration of European stock markets to the prospects of the formation of EMU and the adoption of the euro as the single currency. Specifically, these authors show that in the second half of the 1990s, expected stock returns in Europe became increasingly more determined by EU market risk and less by local risk. However, this methodology has not yet been used to study bond markets integration in the European context.

3. Model

We assume that Government bond excess returns (r_t) for country i are linearly related to world and local information variables as follows:

$$r_{i,t} = a_i + b_i^W Z_{i,t-1}^W + b_i^L Z_{i,t-1}^L + \varepsilon_{i,t} \tag{1}$$

where Z_i^W represents the world variables, Z_i^L, represents local variables for country i, and $\varepsilon_{i,t}$ is an error term.

Eq. (1) is consistent with a range of asset pricing models, and with any level of integration. If a market is fully integrated, the local variables should be absent from Eq. (1). Similarly, if it is completely segmented, the world variables will be absent. We estimate this equation by OLS to identify the relevant world and local instruments.

Once the instruments are identified, we adopt Bekaert and Harvey (1995)'s CAPM-based model and assume that excess returns in country i are generated by the following version of the conditional international CAPM:

$$r_{i,t} = \theta^W \lambda_{w,t-1} \mathrm{cov}_{t-1}(r_{w,t}, r_{i,t}) + (1-\theta^W)\lambda_{i,t-1}\mathrm{var}(r_{i,t}) + e_{i,t} \tag{2}$$

In Eq. (2), θ^W is interpreted as a measure of the degree of integration with world bond markets, $\lambda_{w,t}$ is the world price of risk, and $\lambda_{i,t}$ is the local price of risk.

The excess return on the world portfolio Government's bonds is modelled similarly as:

$$r_{w,t} = \lambda_{w,t-1}\mathrm{var}(r_{w,t}) + e_{w,t} \tag{3}$$

When markets are completely integrated the coefficient θ^W takes the value 1, and the variance term in Eq. (2) is reduced to zero. To model the conditional covariance matrix we use a multivariate GARCH model. Specifically, we use the BEKK model proposed by Engle and Kroner (1995). This model can be written as:

$$\mathrm{H}_t = \mathrm{C}'\mathrm{C} + \mathrm{A}' e_{t-1} e_{t-1}' \mathrm{A} + \mathrm{B}'\mathrm{H}_{t-1}\mathrm{B} \tag{4}$$

where C is a $(N \times N)$ symmetric matrix and A and B are diagonal $(N \times N)$ matrices of constant coefficients. By doing this, we allow the variances to depend only on lagged squared errors and lagged conditional variances and the covariances to depend only upon