Financial indicators signaling correlation changes in sovereign bond markets

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ABSTRACT

We use a Smooth Transition Conditional Correlation GARCH (STCC-GARCH) model applied to the euro area monetary policy rates and sovereign yields of Italy, Spain and Germany at 5-year maturity to estimate the threshold level of the signals above which the sovereign bond market moves to a crisis regime. We show that the threshold to a crisis regime for Italy and Spain is reached when (i) their 5-year sovereign yield spreads amount to about 90 basis points; (ii) their 5-year CDS spreads amount to about 155 basis points or (iii) the 5-year spread between the Kreditanstalt für Wiederaufbau (KfW) bond and the German Bund amounts to about 30–40 basis points. Using impulse responses, we find that the STCC-GARCH with the KfW-Bund spread has leading properties, a feature corroborated by the fact that this indicator suggested a shift to a crisis regime already in August 2007 and has been signaling an improvement of the situation already in the autumn of 2012. An out-of-sample forecast of the STCC-GARCH model is also provided, which is both a novelty and a further robustness check for the stability of the model.

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1. Introduction

The euro area sovereign debt crisis started in the fourth quarter of 2009 after the disclosure of the severe public finance situation in Greece by the then newly elected Greek Prime Minister George Papandreou.[1] Subsequently, the sovereign yield spreads rose sharply for most of the euro area countries and the major credit rating agencies reviewed their analysis, downgrading the sovereign debt of all euro area countries, with the exception of Germany, Finland and Luxembourg. The most critical period was reached in July 2012 when the sovereign credit spreads of Italian and Spanish sovereign bonds vis-à-vis the German Bund reached record highs (about 500–650 basis points). The same spreads were about 200 basis points lower only few months earlier in March 2012.

Therefore, on 26 July 2012, Mario Draghi, President of the European Central Bank (ECB), in a speech at an investment conference in London acknowledged that financial markets were pricing the break-up risk and pledged to do "whatever it takes" to protect the euro area from collapse – including fighting unreasonably high government borrowing costs. So the Eurosystem launched the Outright Monetary Transactions (OMTs) in secondary sovereign bond markets. By mid-September 2012, the Italian and Spanish sovereign credit spreads fell by about 250–350 basis points compared to the peak in July, they declined steadily during the course of 2012 and 2013 and by the beginning of 2014 fluctuated around 150–200 basis points.

Sovereign yields are generally used as benchmark reference rates to price key interest rates, such as the lending rates to households and corporations. Therefore, the time-varying correlation between changes in the policy rate and the changes in the sovereign yield is of paramount importance for a proper transmission mechanism of the monetary policy. It is uncontroversial that the correlation between sovereign yields and the monetary policy rates declines sharply if adverse shocks affect the sovereign debt markets. But obviously, this correlation can even turn negative when sovereign yields and monetary policy rates do again converge. After the launch of the OMTs in the second half of 2012, for example, the Italian and Spanish sovereign yields fell while the monetary policy stance,

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[1] On 16 October 2009, the Greek Prime Minister George Papandreou in his first parliamentary speech disclosed the country's severe fiscal problems and immediately after, on 5 November 2009, the Greek government revealed a revised budget deficit of 12.7% of GDP for 2009, which was double the previous estimate. Since then euro area sovereign spreads vis-à-vis the German Bund rose with important adverse spillover effects from Greece (De Santis, 2014 and Dergiades et al., 2015).

measured by the EONIA (Euro Over-Night Index Average) Swap Index or Overnight Indexed Swap (OIS) rate,[2] in some periods rose or remained constant. Following the normalization of the financial situation, increasingly negative unconditional correlations between sovereign yields and monetary policy rates are a desired outcome, as happened immediately after Mario Draghi's speech in London. Therefore, we suggest a method that estimates correlations in different regimes conditional to the financial situation.

We propose to study the problem using regime-dependent models of the correlation between benchmark sovereign yields and the monetary policy rate with smooth transition methods developed by Silvennoinen and Teräsvirta (2005, 2009, 2013). The two key advantages of Smooth Transition Conditional Correlation GARCH models (STCC-GARCH)[3] are the following: (i) the changes in the conditional correlations are tied to an observable variable; and (ii) the conditional correlations change smoothly between "extreme" values on the basis of a transition function. Once the key drivers of the correlations between sovereign yields and the momentary policy rate are identified, we can (i) study how changes in correlations depend on observable transition variables and (ii) estimate both the threshold for the regime-change and the speed of the smooth transition.

Many authors have developed early warning system (EWS) models for identifying and predicting financial crises, generally applied to currency crisis and emerging markets. For example, Kaminsky et al. (1998) and Kaminsky and Reinhart (1999) transform vulnerability indicators into binary signals and estimate the critical threshold above which it sends the signal triggering a jump. In the Kaminsky–Reinhart approach, the threshold is chosen after a grid search that minimizes the noise-to-signal ratio, where the "noise" is defined as a situation where the indicator issues the signal but no crisis occurs within 24 months, while the "signal" is defined as a situation where the indicator issues the signal and the crisis occurs within 24 months. Berg and Pattillo (1999a,b) depart from the Kaminsky–Reinhart approach that looks for discrete threshold and propose a probit-based model of predicting currency crises, where the threshold is exogenously specified.

However, a key weakness of these models is the failure of distinguishing tranquil periods, when economic fundamentals are largely sound and sustainable, from post-crisis/recovery periods, when economic variables go through an adjustment process before reaching a more sustainable level or growth path. Bussière and Fratzscher (2006) argue that this problem, the so-called post-crisis bias, can be solved if a three regime model, which can distinguish a tranquil regime, a pre-crisis regime, and post-crisis/recovery regime, is estimated using a logit model.

Our approach overcomes these problems as we estimate a non-linear model where the function is a smooth continuous function and the threshold is estimated endogenously. In other words, we can estimate both the threshold for the signal and its effect that takes the form of the S-shape curve. Moreover, (i) we make use of impulse response functions to assess whether the correlations obtained with the STCC models lead the correlations obtained with standard dynamic conditional correlation (DCC) models (Engle, 2002); and (ii) we perform out-of-sample forecasts conditional on the transition variable.

Theory can help us in selecting the indicators. Typically, the nominal sovereign long-term rate with maturity L in country c, $i_{c,t}^L$ can be disaggregated in the following main components:

$$i_{c,t}^L = \left(i_t^{MP} + E_t^{MP}(i_t) + \ldots + E_{t+L-1}^{MP}(i_t)\right)/L + cp_{c,t}^L + lp_{c,t}^L + rp_t + gp_t + \varepsilon_{c,t}^L \tag{1}$$

where the first component in brackets is the average of the expected monetary policy rates, $(i_t^{MP} + E_t^{MP}(i_t) + \ldots + E_{t+L-1}^{MP}(i_t))/L$ common to all euro area countries; the second component is the credit risk premium for sovereigns in country c, $cp_{c,t}^L$; the third component is the liquidity premium for sovereigns in country c, $lp_{c,t}^L$; the fourth component is a regional risk premium, $r_{p,t}$; the fifth component is a global risk premium, $g_{p,t}$, and $\varepsilon_{c,t}^L$ denotes country-specific white noise. This implies that the correlation between changes in the policy rate and the changes in the sovereign yields at time t can shift due to changes in $lp_{c,t-1}^L$, $cp_{c,t-1}^L$, $r_{p,t-1}$, and $g_{p,t-1}$. Abrupt changes in one of these factors at time $t-1$ would sharply reduce the correlation between the sovereign yields and the expected monetary policy rates at time t.

First, we use the sovereign yield spread – defined as the difference between the sovereign yield and the OIS rate at the same maturity – as a comprehensive sovereign risk measure. Then, we employ the following indicators that reflect the above theoretical considerations:

- As a proxy of credit risk, we use the Credit Default Swap (CDS) spread (Duffie, 1999; Pan and Singleton, 2008; Beber et al., 2009; Longstaff et al., 2011).[4]

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[2] The EONIA swap index is an OIS rate for the euro area. It is a fixed-floating rate interest rate swap where the floating rate is indexed to the EONIA rate at which banks provide loans to each other with duration of 1 day. Banks may qualify for the EONIA Swap Index Panel if they meet the following criteria: (1) they are active players in the Euro derivative markets either in the euro area or worldwide and have the ability to transact good volumes in EONIA Swaps, even under turbulent market conditions; (2) panel banks must have a high credit rating and a high ethical behavior, and enjoy an excellent reputation; (3) panel banks must disclose all relevant information requested by the Steering Committee. The number of panel banks will be sufficient to both represent the diversity of the EONIA swap market and guarantee an efficient manageable panel consisting of only prime banks. At present, 25 prime banks constitute the EONIA Swap Index Panel. These selected banks are obliged to quote the EONIA Swap Index for the complete range of maturities, in a timely manner, every business day with an accuracy of three decimal places. The EONIA Swap Index can point to a strict Code of Conduct which sets out the criteria for inclusion of banks in the panel. The Code of Conduct details the obligations resting on each bank, and outlines the tasks and composition of the Steering Committee which oversees the Index. This independent Steering Committee, which consists of 10 members, closely monitors all market developments and ensures, by reviewing panel banks' contributions on a regular basis, strict compliance with the Code of Conduct. It has the right to request information, remove or appoint panel banks.

[3] The STCC-GARCH models have been used to study the correlation between stocks (Aslanidis et al., 2009; Silvennoinen and Teräsvirta, 2005, 2009, 2013 and Chelley-Steeley et al., 2013), stocks and bonds (Stein et al., 2013), stocks and exchange rates (Lee et al., 2011) and other asset classes (Silvennoinen and Thorp, 2013 and Koch, 2011).

[4] During the restructuring of Greek debt in 2012, CDS holders feared that private creditors would accept restructuring on a "voluntary" basis, in which case CDSs would not be triggered. In this case, the sovereign CDSs would have offered no protection against losses on the Greek debt. A collective action clause (CAC) allows a supermajority of bondholders to agree to a debt restructuring that is legally binding on all holders of the bond, including those who vote against the restructuring. On 21 February 2012, 96.9 per cent of private sector bondholders participated in the exchange of their Greek government bonds for short-term European Financial Stability (EFSF) notes and new long-term Greek government bonds, which equated to a reduction of 53.5 per cent in nominal values and around 75 per cent in net present value terms. As the debt swap deal caused economic losses to private creditors, Fitch downgraded Greece's sovereign debt rating from "C" to "RD" (Restricted Default) and the International Swaps and Derivatives Association (ISDA), the industry body that rules on pay-outs, declared a credit event (http://www.ft.com/intl/cms/s/0/0997e7f4-71c4-11e1-b853-00144feab49a.html). Nevertheless, the CDS market's experience in connection with Greece's credit event have generated substantial apprehension and raised several questions regarding the future of the sovereign CDS market. One of these questions is whether the sovereign CDS product, as it currently exists, can be too easily circumvented. Specifically, many market participants expressed dissatisfaction when it became apparent that the Greek debt exchange, as it was originally proposed, would not trigger a credit event due to its "voluntary" nature, arguing that such a comprehensive restructuring should trigger protection payments under CDS contracts. Although a credit event was eventually triggered, the confusion regarding the circumstances under which a credit event would occur in the case of a sovereign debt restructuring has led to calls to modify the relevant ISDA definitions to deal with similar situations in the future.