



Disentangling contagion among sovereign CDS spreads during the European debt crisis[☆]

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ABSTRACT

During the last crisis, developed economies' sovereign credit default swap (hereafter CDS) premia have gained in importance as a tool for approximating credit risk. In this paper, we fit a dynamic factor model to decompose the sovereign CDS spreads of ten OECD economies into three components: a common factor, a second factor driven by European peripheral countries and an idiosyncratic component. We use this decomposition to propose a novel methodology based on the real-time estimates of the model to characterize contagion among the ten series. Our procedure allows the country that triggers contagion in each period, which can be any peripheral economy, to be disentangled. According to our findings, since the onset of the sovereign debt crisis, contagion has played a non-negligible role in the European peripheral countries, which confirms the existence of significant financial linkages between these economies.

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1. Introduction

Understanding the dynamics of sovereign credit risk is crucial given its financial stability implications and its major role in determining the financing costs of the public sector. Thus, higher perceived risk implies higher long-term domestic interest rates, which in turn increase debt costs and offset the stimulus measures adopted during the crisis. Besides, higher sovereign risk has adverse effects on bank funding conditions and financial markets (BIS, 2011).

Since the onset of the financial crisis in 2007, the sovereign credit default swap (hereafter, sovereign CDS) market in developed economies has become more liquid and trading volumes have strongly increased.¹ A CDS is an OTC (over-the-counter) derivative that functions as an insurance contract, where a protection buyer pays a fixed amount (the CDS premium) to the seller until maturity or until the occurrence of the credit event (Duffie, 1999; Pan and Singleton, 2008).² For a sovereign CDS, the credit event is equivalent to the issuer country defaulting on its payment commitments. If this occurs before the CDS maturity, the protection seller pays a compensation to the buyer.³ The premium paid by the buyer of a CDS can be decomposed into two

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¹ According to the BIS (2010), the outstanding amount of sovereign CDS in the first half of 2010 was around 13% of all CDS, whereas at the beginning of the crisis (second half of 2007) this ratio was 6%.

² One key legal difference between a sovereign CDS and an insurance contract is that, contrary to an insurance contract, the CDS does not require the insured asset (that is, the sovereign bond) to be held.

³ The International Swaps and Derivatives Association (ISDA) defines three possible credit events for a sovereign CDS, namely: failure to pay coupon or principal, restructuring and repudiation/moratorium.

basic components: the default risk and the sovereign risk premium component, which is the largest part of the spread (Remolona et al., 2007).

In principle, given the theoretical no-arbitrage condition (Duffie, 1999), sovereign risk can be approximated either through the interest rate spreads on public debt or through the risk premia from sovereign CDS.⁴ We chose to analyze sovereign CDS spreads instead of bond spreads for two reasons. First, bond spread quantification involves choosing a risk-free rate, which means losing the spread of a relevant country in any empirical analysis.^{5,6} Second, in certain periods of financial stress there can be significant discrepancies between both measures. For example, some bond yields could be driven by other effects, such as the “flight to quality” by investors. Nevertheless, during periods of turmoil, CDS spreads can also capture components attributable to counterparty risk (Arce et al., 2013)⁷ or liquidity risk (see Das and Hanouna (2009) for corporate CDS).⁸

Despite the increasing relevance of sovereign CDS spreads, there are still few studies on their dynamics. Until the onset of the financial crisis, most research was focused on emerging markets, where these derivatives were already liquid from the beginning of the 2000s (see, among others, Pan and Singleton, 2008; Longstaff et al., 2011; Remolona et al., 2007).⁹ By contrast, the literature on sovereign CDS for developed countries is still at an early stage amid strong doubts among market participants about its functioning.¹⁰ However, as these time series become longer and this market deepens, these spreads are turning into an alternative measure of credit risk to government bonds in empirical applications. As a result, the recent literature that explicitly deals with sovereign CDS spreads in the euro area is increasing. Among other topics, these empirical works analyze CDS spread determinants or their link with bond spreads (price discovery).¹¹

There are two empirical regularities in the literature on sovereign CDS spreads of relevance for our analysis. First, sovereign premia exhibit a strong commonality, meaning they are highly related to a common factor. For instance, Longstaff et al. (2011) analyze 26 sovereign CDS spreads (mostly from emerging countries) and conclude that the first principal component represents 64% of their total variation (see also Remolona et al., 2007). Second, sovereign credit risk seems to be mostly driven by global market factors rather than by country-specific fundamentals, as the changes in the common component of sovereign CDS premia are closely related to developments in aggregate worldwide risk aversion. Hence, Longstaff et al. (2011), in keeping with Pan and Singleton (2008), interpret that the main source of variation across credit spreads is linked to US stock market returns and volatility (as proxied by the VIX index).

Given these regularities it seems sensible to use a dynamic factor model to analyze sovereign CDS spread dynamics. However, one of the peculiarities of crisis periods regarding multivariate credit risk modeling is that the classical factor decomposition into two factors—namely, common and idiosyncratic—has become obsolete given the emergence of a third element rooted in contagion from third countries. This new framework calls for rethinking as to how to model accurately the influence of individual countries, which will not be captured in the common component, taking into account that the country that drives contagion can change over time. For instance, Greece formally asked for a financial assistance program in April 2010, which coincided with an increase of the CDS spreads of the remaining developed countries, especially the European peripheral economies. However, in an accurate time series exercise it would not be correct to consider Greece as the sole source of contagion in the subsequent time span. For instance, Ireland and Portugal could have also exerted an influence in the remaining countries when they asked for their assistance programs in November 2010 and April 2011, respectively. Given the importance of financial contagion in the context of the sovereign debt crisis, this literature is growing rapidly, both for sovereign CDS and bond spreads (see, for instance, Amisano and Tristani, 2011; Fornari, 2012 or Caporin et al., 2013).¹²

The main objective of this paper is to analyze with a dynamic factor model the sovereign CDS spreads of ten OECD countries, namely, eight euro area countries, the United States and the United Kingdom.¹³ Apart from the common and idiosyncratic component, we also fit a third component that is related to the impact of peripheral countries. As a novel contribution of the paper, once we decompose the ten series, we identify contagion using the estimates of the model in real-time by focusing on the dynamics of the elements of the Kalman filter. In a sense, our model approach is in line with that of Dungey and Martin (2007), as we also fit a dynamic factor model but, contrary to them, our contagion identification is not model-based but is disentangled through the real-time estimates of the model once it is identified. The main advantage of our procedure compared to previous models is that we do not impose the country source of contagion, which can vary across periods. That is to say, as our identification method is dynamic our approach is more flexible and realistic than those of prior empirical exercises.

⁴ An abundant strand of this literature analyzes the deviations from this parity and price discovery between CDS and bond spreads. See Blanco et al. (2005), who study this link for corporate CDS spreads.

⁵ In any case, recently the pool of government bonds considered as risk-free assets has narrowed so that their election would not be straightforward (Cooper and Scholtes, 2001).

⁶ To overcome this problem, alternatively other authors use the swap rate as a risk-free rate to compute bond spreads (Fontana and Scheicher, 2010).

⁷ According to Arce et al. (2013), the presence of counterparty risk during global episodes of distress makes the use of bond spreads preferable.

⁸ The lack of consensus among authors regarding the advisability of using CDS spreads or bond spreads to analyze crisis periods leads to some authors using both measures as a robustness check (Caporin et al., 2013).

⁹ To date, the more developed strand of the literature on CDS is that on corporate CDS rather than sovereign CDS spreads. See Blanco et al. (2005), Longstaff et al. (2005), or Ericsson et al. (2009), among others.

¹⁰ For instance, Duffie (2010) analyzes whether speculation drives up European sovereign CDS spreads.

¹¹ See Fontana and Scheicher, 2010; Arce et al., 2013; Carboni, 2011 or Palladini and Portes, 2011, for some recent papers on price discovery between sovereign CDS premia and bond yields. Alberola et al. (2012) analyze a broad sample of emerging and developed countries with a panel data model.

¹² For further empirical works on financial contagion during the European sovereign debt crisis following diverse methodologies see, for instance, Andermatten and Brill, 2011; Zhang et al., 2011; Kalbaska and Gatkowski, 2012; Gündüz and Kaya, 2013 or Manasse and Zavalloni, 2013.

¹³ As far as we know, to date Kocsis (2012) and Manasse and Zavalloni (2013) are the only papers that use a multivariate model to analyze sovereign credit risk in the euro area.

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