



# The dynamics of spillover effects during the European sovereign debt turmoil<sup>☆</sup>



Adrian Alter<sup>a,\*</sup>, Andreas Beyer<sup>b,c</sup>

<sup>a</sup>International Monetary Fund, 700 19th St. NW, Washington, DC 20431, USA

<sup>b</sup>European Central Bank, Kaiserstrasse 29, 60311 Frankfurt am Main, Germany

<sup>c</sup>Centre for Financial Studies, Frankfurt am Main, Germany

## ARTICLE INFO

### Article history:

Received 29 April 2013

Accepted 18 January 2014

Available online 30 January 2014

### JEL classification:

C58

G01

G18

G21

### Keywords:

Credit default swaps

Contagion

Sovereign debt

Systemic risk

Impulse responses

## ABSTRACT

In this paper we modify and extend the framework of [Diebold and Yilmaz \(2011\)](#) to quantify spillovers between sovereign credit markets and banks in the euro area. Spillovers are estimated recursively from a vector autoregressive model of daily changes in credit default swap (CDS) spreads with exogenous common factors. We account for interdependencies between sovereign and bank CDS spreads and derive generalized impulse response functions. Specifically, we assess the systemic effect of an unexpected shock to the creditworthiness of a sovereign or country-specific bank index on other sovereigns and bank CDSs between October 2009 and July 2012. Channels of shock transmission from or to sovereigns and banks are summarized in a Contagion Index and its four components: (i) among sovereigns, (ii) among banks, (iii) from sovereigns to banks, and (iv) from banks to sovereigns. We also highlight the impact of policy-related events on the Contagion Index.

© 2014 Elsevier B.V. All rights reserved.

## 1. Introduction

The European sovereign debt crisis has been one of the most challenging episodes faced by governments and central banks since the introduction of the euro. Since the collapse of investment bank Lehman Brothers in September 2008, gauging the risk of contagion<sup>1</sup> following financial sector shocks remains a top priority on the research and policymaking agendas. [Dornbusch et al. \(2000\)](#) and [Forbes and Rigobon \(2002\)](#) describe contagion as a significant increase in cross-market interdependencies after a large shock hits one country or a group of countries. Contagion viewed from this perspective is hence determined by the portion of interdependency that exceeds any fundamental relationship among countries and that cannot be attributed to common shocks. More generally, contagion

<sup>☆</sup> The views expressed in this paper are those of the authors and do not necessarily reflect those of the European Central Bank (ECB), the Eurosystem, the International Monetary Fund (IMF), its Executive Board, or IMF policies.

\* Corresponding author. Tel.: +1 202 560 4713.

E-mail addresses: [AAAlter@imf.org](mailto:AAAlter@imf.org) (A. Alter), [Andreas.Beyer@ecb.int](mailto:Andreas.Beyer@ecb.int) (A. Beyer).

<sup>1</sup> The existing literature employs a wide range of definitions for contagion (see, e.g., [Forbes, 2012](#)).

can also be associated with a *negative externality* triggered by institutions or market participants in distress that affect other players.<sup>2</sup> [Constâncio \(2012\)](#) extends this definition of contagion by requiring an initial trigger-event and an abnormal speed, strength, or scope that accompanies financial instability.

In this paper we use as theoretical background the approach of [Allen and Gale \(2000\)](#) who explain contagion as the consequence of spillover effects. In their setup, a banking crisis in one region may spill over to other regions. Contagion is hence the phenomenon of extreme amplification of spillover effects. Spillover effects are therefore a necessary, though not sufficient, condition for contagion. But when are spillovers “extreme” and when do they trigger contagion? How can we distinguish between spillovers with “normal” vs. “non-dangerous” magnitudes? In this paper

<sup>2</sup> [Hartmann et al. \(2005\)](#) summarize five key criteria for identifying contagion as follows: (i) an idiosyncratic negative shock that affects a financial institution and spreads to other parts of the financial system or an idiosyncratic negative shock that affects an asset and triggers declines in other asset prices; (ii) the interdependencies between asset prices or defaults are different than in tranquil times; (iii) the excess dependencies cannot be explained by common shocks; (iv) events associated with extreme left tail returns; and (v) interdependencies evolve sequentially.

we present a method and an index that can answer these questions in quasi real time. We also propose an empirical framework for measuring spillover effects and apply it to inter-linkages between sovereign credit markets and systemically relevant banks in the euro area. We analyze daily data of CDS spreads to quantify spillover effects based on a 80-days rolling regression window. Our measure internalizes interdependencies of the variables in the system. We aggregate this information into a Contagion Index (CI). This index has four main components: the average potential spillover (i) among sovereigns, (ii) among banks, (iii) from sovereigns to banks, and (iv) from banks to sovereigns.

There are several mechanisms that explain the transmission of spillover effects among sovereigns and banks. Spillovers among euro area sovereign bonds occur because these are linked by the joint monetary policy transmission mechanism, the Eurosystem's collateral framework, and the shared default risk of Eurozone member countries via the European Financial Stability Facility (EFSF) and the European Stability Mechanism (ESM).<sup>3</sup> Spillover effects between the sovereign and domestic banks are amplified by a feedback mechanism – one that has intensified during the financial crisis. The dynamics of sovereign–banks feedback loops are driven by systemic financial externalities that can have a negative impact on fiscal positions and the real economy.<sup>4</sup> Sovereign debt amplification feeds back into the financial sector by affecting the balance sheets of financial institutions, reducing domestic banks' ratings and pushing up their funding costs (BIS, 2011). With a domestic financial sector in distress, sovereign creditworthiness deteriorates further and government guarantees for the financial sector lose credibility, yielding further amplification of spillovers. Increasing government liabilities raise the debt burden and put even more pressure on sovereigns. Finally, contagion risks are transmitted within the banking sector because of common credit exposure, interbank lending, and derivatives trades. Portfolio rebalancing and information asymmetries among market participants can induce spillover effects as well.

Our objective is to assess the dynamics of financial contagion among sovereigns and banks and identify the main contributors to contagion within the Eurozone. In the European Monetary Union context where on the one hand monetary policy is centralized and on the other hand fiscal policy is run by national governments, contagion is of particular relevance for the analysis of systemic risks of the whole financial system. Financial contagion is proxied by what we call “excess spillovers.” What we intend to measure is the perceived risk transfer among banks and sovereigns, incorporating spillover effects. Moreover, we analyze the effects of several policy events on financial contagion. There are two issues that make this analysis difficult: first, there is the problem of anticipation, as future developments may already be incorporated into observed market prices; second, our econometric framework is only able to fully incorporate shifts in parameters with a lag (i.e., maximum after 80 trading days).

Our empirical framework is based on a medium-size vector autoregressive model with exogenous variables (VARX). These exogenous variables account for common global and regional trends that allow us to identify and to measure the systemic contribution of sovereigns and banks. We fit the model recursively based on daily log-returns of sovereign and bank CDS series from

October 2009 to July 2012. The use of CDS data was partly motivated by recent studies which show that past CDS spreads improve the forecast quality of bond yield spreads (Palladini and Portes, 2011; Fontana and Scheicher, 2010). We derive generalized impulse response functions (GIRF) as functions of residuals together with the interdependence coefficients. The GIRFs serve as input for inference and detection of spillovers in the euro area.

We extend the methodology of Diebold and Yilmaz (2011) as follows. Instead of using the forecast error variance decomposition, we use the framework of generalized impulse responses. In this setup, we analyze the normalized potential spillover effects of an unexpected shock to each variable on others. We determine an optimal rolling window size for our VARX model (80 days). The optimal size reflects a trade-off between robustness and reliability of estimated coefficients on the one hand (the longer the sample, the better the quality) and gaining information about a build-up of spillover effects over time on the other (by aiming for many windows of shorter samples).

Our main results document increasing spillovers and hence potential high likelihood of contagion prior to key financial market events and policy interventions during the European sovereign debt crisis. While the CI for banks remains stable during the 2009–2012 period, both the CI for sovereigns and the overall CI (for both banks and sovereigns) trend upward. The individual net contributions to systemic risk of the IMF/EU program countries are high before their respective bailouts, but steeply decline afterwards. Spillover effects from banks to sovereigns and vice versa trend upward during periods of stress, reflecting the tightening nexus between banks and sovereigns in the Eurozone.

The remainder of this paper is organized as follows. In Section 2 we discuss studies related to our research. Section 3 presents the data and the methodology utilized. Section 4 presents our results, Section 5 provides some empirical robustness checks, and Section 6 concludes.

## 2. Related literature

Our paper contributes to a large body of literature on contagion in financial markets. Forbes and Rigobon (2002) define contagion as periods when there is a significant increase in cross-market correlation. While estimated correlations increase during times of macroeconomic stress, they tend to be biased upwards. Forbes and Rigobon (2002) argue that stable yet high co-movement during tranquil and crisis times should be referred to as *interdependence*. Allen and Gale (2000) analyze contagion caused by contractual linkages among banks. When one region suffers a banking crisis, banks from other regions that hold claims against the affected region have to account for the devaluation of these assets and their capital is eroded. Spillover effects from the affected region can trigger infection of adjacent regions. Allen and Gale (2000) refer to this extreme amplification of spillover effects as *contagion*. This mechanism can also be explained by self-fulfilling expectations: if shocks from a region serve as signals that improve the prediction of shocks to another region, then a crisis in the former region creates the expectation of a crisis in the latter region.

By proposing a novel methodology, our paper also adds to a number of studies that develop contagion methodologies, including Caceres et al. (2010), Caporin et al. (2012), Claeys and Vařiček (2012), De Santis (2012), Donati (2011) and Zhang et al. (2011). Dungey et al. (2004), ECB (2005), and ECB (2009) review the methods commonly-used to measure financial contagion. De Santis (2012) finds that global, country-specific and contagion risks are the main factors that drive sovereign credit spreads in the euro area. Based on a multivariate model with time-varying correlations

<sup>3</sup> The European Financial Stability Facility (EFSF) was created on 9 May 2010 as a temporary facility to provide loans to euro area Member States. The European Stability Mechanism (ESM) was set up on 24 June 2011 as a permanent crisis mechanism. The share of the countries guaranteeing the EFSF's debt is proportional to the capital share of each country in the European Central Bank (ECB) adjusted to exclude countries with EU/IMF supported programs.

<sup>4</sup> See, e.g., Acharya et al. (forthcoming), Alter and Schüler (2012), Bicu and Candelon (2012), De Bruyckere et al. (2012), Merler and Pisani-Ferry (2012) or Gross and Kok (2013).

Download English Version:

<https://daneshyari.com/en/article/5089018>

Download Persian Version:

<https://daneshyari.com/article/5089018>

[Daneshyari.com](https://daneshyari.com)