Deciphering financial contagion in the euro area during the crisis

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ABSTRACT

Financial market interdependence has been at the epicenter of the crisis in the euro area. This paper tests for the existence of financial contagion during this crisis, defined as the international transmission of country-specific shocks beyond the normal channels of financial interdependence. Since contagion relates purely to country-specific shocks, we combine the standard contagion test of Favero and Giavazzi (2002) with a narrative approach to separate out global and euro area shocks from country-specific shocks. Financial contagion has been widespread during the crisis in the euro area. Three quarters of country-specific shocks are contagious over the whole sample period. But the proportion of contagious country-specific shocks has fallen markedly after the "whatever it takes" announcement in July 2012.

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1. Introduction

Ever since the collapse of Lehman Brothers in September 2008, financial market interdependence has been at the epicenter of the global financial market mayhem. Much in the same fashion as the famous butterfly effect, shocks occurring in a specific asset market in a particular country seem to spread throughout the entire global financial system. The international transmission of country-specific shocks should not come as a surprise. The process of globalization has led to a relatively high level of economic and financial interdependence across countries. This being said, there is often a perception that the transmission of shocks is different, in particular stronger, during episodes of financial crises. Accordingly, financial contagion is said to exist when the transmission of unusually large country-specific shocks goes beyond the normal degree of financial market interdependence.

In this paper, we test for contagion between sovereign bond markets in the euro area during the financial crisis. Several countries which adopted the euro as a common currency have

been suffering from heightened financial market volatility. Large shocks in some countries are spreading through the whole area. Again, such a transmission of shocks should be expected given the large degree of financial integration across the euro area (Gonzalez-Paramo, 2011). This being said, anecdotal evidence suggests that the degree to which country-specific shocks are spreading to other countries has *changed* since the onset of the financial crisis. Accordingly, we test in a formal setting whether, since the onset of the financial crisis, the transmission of shocks specific to individual euro area countries differs from what the normal degree of financial market interdependence would imply. We follow the approach put forward by Favero and Giavazzi (2002) to model financial market interdependence and to test for the existence of financial contagion. This approach addresses several pitfalls identified in other studies which are outlined in our review of the literature.

Our main contribution to the empirical literature on financial contagion is the use of a narrative approach to separate out different sources of shocks. Financial markets are rocked by a wide range of shocks. We distinguish between global shocks, euro area shocks, and country-specific shocks. Global shocks typically affect all countries simultaneously, in the same way but not necessarily to the same extent. From the perspective of the euro area, the collapse of Lehman Brothers represented a global shock to their

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sovereign bond markets as investors were fleeing to the safe haven of riskless sovereign bonds. Euro area shocks affect several euro area economies simultaneously, but not necessarily in the same way. The creation of the European Financial Stability Facility in May 2010 led to a sharp decrease in sovereign bond yields in the periphery of the euro area, but an increase in the sovereign bond yields of Germany and the Netherlands. Country-specific shocks are, by definition, idiosyncratic to the country under consideration. A proper test of contagion, focusing on the transmission of unusually large country-specific shocks across borders, requires a proper identification of country-specific shocks to start with. Failing to separate out global shocks and euro area shocks from country-specific shocks may lead us to conclude, incorrectly, that contagion occurs when two national bond markets are actually affected by a common shock. The identification of different types of shocks relies on the historical record of financial news. This identification procedure is interesting in and of itself as it provides significant qualitative information about the unfolding of the crisis.

We focus on the sovereign bond markets of nine euro area countries, namely Belgium, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain. The sample period extends from January 2007 to March 2014. Our results show that financial contagion across sovereign bond markets in the euro area has been widespread during the crisis. Three quarters of country-specific shocks are contagious. While the famous "whatever it takes" announcement by ECB President Draghi in July 2012 led to a drastic fall in the frequency of shocks in sovereign bond markets in the euro area, it also significantly reduced the proportion of contagious country-specific shocks. Our estimations point to a reduction of 25 percentage points in the likelihood that a country-specific shock will be contagious. We also find that about 40 percent of contagious country-specific shocks induce opposite effects on some other countries in the sample. This evidence points to asymmetric contagion, whereby a shock in a country induces an opposite movement in the bond yields of some other countries. From a methodological point of view, this finding illustrates the need to identify each country-specific shock individually, instead of relying on sub-samples of the data and assuming that contagion necessarily entails stronger interdependence. The set of possible effects is quite large. The combination of the statistical approach of Favero and Giavazzi (2002) and our narrative approach allows us to consider the full set of possible effects, thus improving on the existing literature.

The remainder of this paper is organized as follows. Section 2 reviews the existing literature. Section 3 describes the empirical approach put forward by Favero and Giavazzi (2002) and explains how the narrative approach helps identifying different sources of shocks. Section 4 deals with data. Section 5 presents our estimation results in two steps, in line with the approach of Favero and Giavazzi (2002), and provides for further interpretation. Section 6 summarizes the main messages of our paper and outlines some avenues for future research.

2. Literature review

A large literature on financial contagion developed in the aftermath of financial crises in advanced economies in the late 1980s and early 1990s, and in emerging market economies during the 1990s. A lot of attention was devoted to define contagion. Several early contributions modeled contagion as a process through which shocks in one country would be transmitted to other countries. For example, Eichengreen, Rose, and Wyplosz (1996) explored the impact of a currency crisis in one country on the probability that another country may also experience a currency crisis. Such an approach comes close to the epidemiological literature where the probability that someone catches a given disease is a probability function of someone else's having this disease, other things equal. Furthermore, one may study which country characteristics make it more vulnerable to infection from a currency crisis elsewhere.

Later contributions have refined the definition of contagion (see, for example, Forbes & Rigobon, 2002). The process of globalization has led to a sharp rise in real and financial interdependence across countries. Thus, it should be no surprise that shocks in one country spread to other countries. Trade and financial linkages have been identified as two major avenues for the transmission of country-specific shocks (Forbes, 2002; Van Rijckeghem & Weder, 2001). But there has often been a perception that the strength of the transmission of shocks is different during crises. This is a different question. Are country-specific shocks transmitted across countries differently during financial crises? In this context, contagion has been defined as the international transmission of country-specific shocks *beyond* the normal channels of financial market interdependence.[1] This is the definition which we adopt in this paper.

The emerging literature on the crisis in the euro area can be divided along the lines of the early and late definitions of contagion. Several papers focus on the transmission of changes in bond yields or CDS spreads across euro area economies.[2] Arezki, Candelon, and Sy (2011) and Afonso, Furceri, and Gomes (2012) assess the extent to which sovereign credit rating changes in a given country affect bond yields and CDS spreads in other countries. Similarly, De Santis (2014) examines how rating downgrades for Greece have affected other euro area countries. The spirit of these three studies relates closely to the pioneering work of Eichengreen et al. (1996) for currency crises. Mink and De Haan (2013) use an event study approach to assess the impact of Greek rating downgrades on the stock returns of 48 commercial banks in Europe. Finally, Caceres, Guzzo, and Segoviano (2010) construct a spillover coefficient for ten euro area countries and find that distress in one country raises the probability of a credit event in other countries. As such, these studies cast light on the transmission of country-specific shocks across countries, but they do not test whether the strength of this transmission differs when unusually large shocks occur.

A range of other papers have focused on the later definition of contagion, testing whether sovereign bond yields or CDS spreads in some countries are affected differently when a country experiences an unusually large shock. Some of these contributions are inspired by the correlation approach to testing for contagion.[3] Missio and Watzka (2011) compute dynamic pairwise correlations between seven euro area economies, assuming that the crisis originates in Greece. Similarly, Fong and Wong (2012) make use of CoVaR, a measure of the value-at-risk associated with one country conditional on the value-at-risk associated with another country in crisis. Gomez-Puig and Sosvilla-Rivero (2013) use rolling Granger-causality regressions for pairs of euro area countries to assess the

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[1] See Dungey, Fry, Gonzalez-Hermosillo, and Martin (2005) for an exhaustive review of methodologies to test for contagion.

[2] There is of course a large literature on the determinants of sovereign bond yields. See, for example, Bernoth and Erdogan (2012) and the references therein. This literature focuses more closely on the factors which explain sovereign risk and not so much on bond market interdependence and contagion.

[3] Boyer, Gibson, and Loretan (1999) and Forbes and Rigobon (2002) show that the correlation coefficient during a crisis period may change purely because volatility increases during that period, and not because the degree of financial market interdependence has changed. Forbes and Rigobon (2002) propose an adjustment to the correlation coefficient estimated over the crisis period. However, this adjustment is only valid under the assumption that the financial market variable in the country where the shock originates is exogenous. This assumption is unlikely to be satisfied in the case of highly interdependent financial markets.