

Financial contagion during the European sovereign debt crisis: A selective literature review

Dr. Vassilios G. Papavassiliou

Research Fellow, Department of Management Science and Technology of the
Athens University of Economics and Business, Greece

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49, Vas. Sofias Avenue, 106 76 Athens Greece
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Dr. Vassilios G. Papavassiliou

Vassilios Papavassiliou holds a Ph.D in Finance from the Queen's University of Belfast, U.K., a Master's degree in Finance and Banking from the Athens University of Economics and Business, and a Bachelor's degree in Economics from the National and Kapodistrian University of Athens. His research interests span the areas of market microstructure, high-frequency finance and asset pricing. His work has been published in international refereed journals and he has acted as referee for a number of finance journals as well. He has taught finance courses to both undergraduate and postgraduate students at the Athens University of Economics and Business and other universities. Since 2011, he holds a Research Fellowship at the Department of Management Science and Technology of the Athens University of Economics and Business. He brings significant multi-year experience in investment banking and has held senior management positions in both multinational and Greek domestic banking institutions.

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Abstract

Contagion is an elusive concept and several definitions have been used in the literature. According to Forbes and Rigobon (2002) contagion is defined as a significant increase in cross-market linkages after a shock to one country. In this paper we provide a selective literature review on international financial contagion, placing special emphasis on the ongoing European sovereign debt crisis. In summary, empirical research has pointed toward the existence of contagion effects during periods of financial turmoil. The paper summarizes various policy measures and institutional reforms that would help regulators and policy makers to deal with the adverse effects of contagion.

Keywords

financial contagion, European sovereign debt crisis, financial markets, interdependence

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1. Introduction

Since the summer of 1997, the definition of the term contagion has been expanded to include episodes of turmoil in international financial markets. A currency crisis in Thailand spread mainly throughout East Asia, Russia, and Brazil but also affected the Western world and caused the collapse of Long-Term Capital Management (LTCM), one of the largest U.S. hedge funds. As Claessens and Forbes (2001) note, contagion incorporates many different ideas and concepts. Not only contagion is a disease, but it also refers to the transmission of a disease among different markets and countries. The magnitude of risk spillovers from one country to another depends on how weak a country's economic fundamentals are and the level of its exposure to certain financial agents.

Contagion is an elusive concept and several definitions have been used in the literature. In Rigobon (2002a) the definitions of contagion can be divided into two broad categories. The first considers contagion to be equivalent to a change in the strength of the propagation of cross-country shocks, while the second associates contagion with the various channels through which the shocks are transmitted. The empirical tests of the first category aim to determine whether the propagation of shocks remains unchanged around periods of financial market turbulence or not. If the propagation of shocks is unstable, then there is an indication that contagion has occurred. This interpretation has been widely referred since then as *shift contagion*. In the second category, all standard fundamentals of transmission of financial information, such as trade and economic links or shared capital markets should not be considered contagion, but only the transmission of shocks that takes place *in excess* of these fundamentals. The definition of this second category is *pure contagion*, referring to the transmission of shocks occurring via non-fundamental channels only.

There are many explanations of contagion according to Summers (2000): (a) income shocks that are transferred from one country to the other due to trade and economic linkages (b) excessive depreciation of many currencies that are explained by severe competition among countries (c) financial linkages among countries leading to asset-market correlations (d) excessive market illiquidity which feeds contagion via massive withdrawals in other markets abroad (e) panic, herding, and positive feedback trading due to investors' irrationality (f) "reputational externalities" which affect investors' expectations about vulnerabilities and structural conditions in other countries¹.

The most popular definition of contagion is the one proposed by Forbes and Rigobon (2002). They define contagion as a significant increase in cross-market linkages after a shock to one country. Even if two markets continue to be highly correlated after a shock to one market, this does not necessarily constitute contagion. Only if cross-market linkages increase significantly after a shock, this suggests that the transmission mechanism between the two markets strengthened after the shock and contagion occurred. Insignificant increases in cross-market relationships are characterized as *interdependence*, according to Forbes and

¹ Claessens and Forbes (2001) argue that hedge funds are obvious candidates to blame for contagion since they take large positions against market sentiment leading to large market swings.

Rigobon (2002). The three main financial markets that are used in the contagion literature are the international stock, bond and foreign exchange markets.

Cross-market correlation coefficients are conditional on market volatility. Historically, markets are more volatile during turbulent periods resulting in upward biased estimates of correlation coefficients. If no adjustment for this bias takes place, then the relevant tests find evidence of contagion even if contagion does not exist. Forbes and Rigobon (2002) show that tests for contagion based on correlation coefficients are biased upward due to heteroskedasticity in market returns and propose an adjusted for this bias unconditional correlation coefficient.

Besides contagion, two other closely interrelated strands of the literature have evolved which are summarized in Baur and Lucey (2009): flight-to-quality and flight-from-quality. Flight-to-quality refers to a situation where, during times of increased stock market uncertainty, the prices of governments bonds tend to increase relative to stocks, and the return co-movement between the two asset classes becomes less positively correlated (Connolly et al., 2005)². On the other hand, flight-from-quality from bonds to stocks is also characterized by a significant decrease in the correlation coefficient, however, the correlation change occurs during a bond market crisis period. Baur and Lucey (2009) suggest that contagion and flights are mutually exclusive effects in a cross-asset perspective, however, in a cross-country perspective there can be contagion and flights at the same time. Undoubtedly, flights tend to increase the stability of the financial system and can mitigate the losses investors suffer in crises periods.

The purpose of this paper is twofold. First, we provide a selective, non-exhaustive literature review on international financial contagion, placing special emphasis on the European sovereign debt crisis period. Second, we refer to various policy implications from the European sovereign debt crisis and review the major policy measures and reforms that will mitigate the adverse effects of contagion. The remainder of the paper is organized as follows. Section 2 provides a literature review on international financial contagion excluding the eurozone crisis. Section 3 describes the facts of the European sovereign debt crisis. Section 4 provides a selective literature review on the existence of contagion during the European debt crisis period. Section 5 discusses the policy implications of contagion and provides recommendations to policy makers and regulators. Finally, Section 6 offers some concluding remarks.

2. Literature review on international financial contagion excluding the Euro crisis

A major crisis of the 1980s that shook the world's financial markets was the 1987 U.S. market crash. Rigobon (2002a) refers to the major financial crises of the 1990s. The Tequila Effect of the Mexican peso of December 1994, the Asian Flu or "yellow fever" at the end of 1997, the Russian Cold of August 1998, the Brazilian Sneeze of January 1999, and the Nasdaq Rash that began in April 2000. Results on the existence of contagion are mixed. In summary, empirical research based on correlation coefficients produce the same result: During periods

² During flight-to-quality episodes the risk premium investors require per unit of volatility increases, as their risk aversion increases (see Vayanos, 2004 for an interesting discussion).

of turmoil, correlations tend to go up significantly, pointing toward the existence of a contagion effect.

Various empirical studies show that correlations increase in stock markets during hectic periods and contagious effects occur (Wälti, 2003; Corsetti et al., 2005; Billio and Caporin, 2010; Hossein and Nossman, 2011). Cross-asset correlations generally decrease in times of crises, especially in the case between bonds and stocks (Hunter and Simon, 2004; Connolly et al., 2005). This result can be explained by the flight-to-quality episodes that take place leading to “decoupling”, where high positive correlations among stock markets are observed, but negative correlations between stock and bond markets (Gulko, 2002).

King and Wadhvani (1990) and Lee and Kim (1993) find a significant increase in the cross-country correlation coefficients of returns during the October 1987 U.S. market crash, which is translated as evidence of contagion. The studies by Hamao et al. (1990) and Lin et al. (1994) also find their roots in the stock market crash of October 1987. Both studies investigate the extent of price volatility and the correlation degree between volatility and returns in New York, Tokyo, and London, and find evidence of contagion across equity markets.

The investigation of mean and volatility spillovers across international developed and emerging stock markets has provided useful insights. Studies such as those by Koutmos and Booth (1995), Ng (2000), and Worthington and Higgs (2004), suggest that spillovers mainly move from developed to emerging markets, and that emerging markets are more integrated than the developed ones. Masson (1998) refers to an effect known as monsoonal where countries are affected simultaneously by crises caused by common shocks, which in turn causes a withdrawal of offshore funds. This simultaneous movement among countries and markets can be explained by common external factors, such as a rise in U.S. interest rates or a devaluation of the dollar, as well as trade linkages and market sentiments.

Calvo and Reinhart (1996) provide evidence of contagion during the Mexican crisis, as they find increased correlations across stock and bond returns for emerging markets in Latin America.

Baig and Goldfajn (1999) suggest discernible patterns of contagion during the East Asian crises and present evidence in favor of substantial contagion in the foreign debt markets, as well as a more tentative evidence on stock market contagion. Corsetti et al. (2005) find evidence of contagion for a small number of countries during the East Asian crisis. Cerra and Saxena (2002) investigate the reasons behind the currency crisis in Indonesia in 1997 and provide evidence that the crisis was a result of contagion from speculative pressures in Thailand and Korea. Glick and Rose (1999) identified currency market contagion across five Asian countries and show that the primary channel of contagion was the strong trade linkages among countries. A similar result is provided by Van Rijckeghem and Weder (2001).

Dungey et al. (2002) examine the transmission of the Russian crisis and the LTCM near-collapse to 12 countries among several world regions, employing the daily behavior of the risk premia in those countries. The results show that there exists significant contagion from both crisis events to other economies in the sample. The LTCM near-collapse appears to have had a larger effect than the Russian crisis on most of the countries. The unscaled by the level of volatility results on whether contagion is more substantial for developed or emerging markets are mixed. Emerging markets such as Brazil and Thailand were more affected by contagion than the U.K., however, Indonesia, Mexico and Korea were less

affected by contagion than the U.S. and the Netherlands. On the other hand, the scaled by the level of volatility results show that the magnitude of contagion is relatively larger for emerging countries.

Gravelle et al. (2003) focus on shift contagion and develop a methodology to detect it statistically. In particular, they examine whether existing linkages between assets of different countries remain stable during crises, or whether they grow stronger. They conduct their analysis on the bond markets of four emerging countries and on the currency markets of seven developed countries and provide evidence of shift contagion among these assets. Their empirical results suggest that, for Latin-American countries, shocks are transmitted via long-term linkages between countries, so that longer-term strategies to deal with contagion might be more effective. Also, for developed currency markets, they suggest that shocks are transmitted only during turbulent periods implying that short-term strategies to stabilize markets may be warranted.

Connolly and Wang (2003) investigate the return comovement in international equity markets with a focus on the distinction between economic fundamentals and contagion. In particular, they examine the potential macro news effect based on a data set of macroeconomic news announcements made in the U.S., U.K., and Japan. Their findings suggest that future inquiry on market comovement may focus on the distinction between contagion and trading on private information, rather than public information. Chan-Lau et al. (2004) introduce global extreme contagion measures constructed from bivariate extremal dependence measures. Their main results suggest that contagion patterns differ within regions and across regions, with Latin America showing a secular increase in contagion, and that only the 1998 Russian and Brazilian crises led to a global increase in contagion.

Dungey and Martin (2004) measure the contribution of contagion to the volatilities of exchange rates during the East Asian currency crisis, using a multifactor model of exchange rates which allows for both time-dependent common and idiosyncratic factors, as well as unanticipated shocks across currency markets. The empirical results show evidence of significant contagion, especially for Indonesia. Dungey and Martin (2007) formulate an empirical model of multiple asset classes across countries, in which spillover and contagion effects are formally specified. The framework is applied to modeling linkages between currency and equity markets during the East Asian financial crisis of 1997–1998. The results show that spillovers have a relatively larger effect on volatility than contagion, but both are statistically significant. Moreover, in a similar study Dungey et al. (2004) show that there is evidence that the transmission of volatility in the East-Asian currency markets to the developed markets in the region is not due to contagion but due to common world factors.

Ito and Hashimoto (2005) find contagion between equity and currency markets. Bohl and Serwa (2005) test whether European stock markets were affected by a range of crises, namely the Asian, Russian, Brazilian, Argentinean, Turkish, and U.S. ones and find no contagion effects among countries and markets, but only interdependence. Caporale et al. (2005) test for contagion within the East Asian region using a parameter stability test and controlling for three types of bias, resulting from heteroscedasticity, endogeneity and omitted variable. Their findings suggest the existence of contagion within the East Asian region, consistent with crisis-contingent theories of asset market linkages. Baur and Schulze (2005) introduce a new model to analyze financial contagion based on a modified coexceedance measure. They define contagion as the crisis-specific coexceedance not explained by the covariates for different quantiles. Results for daily stock index returns show

that some contagion exists and is predictable within and across regions. Also they show that, contagion depends on a regional market return and its volatility and is stronger for extreme negative returns than for extreme positive returns.

Bekaert et al. (2011) analyze the transmission of crises to country-industry equity portfolios in 55 countries using the 2007-2009 financial crisis as a laboratory. They find evidence of systematic contagion from U.S. markets and from the global financial sector although the effects are very small, however, they show that there is substantial contagion from domestic equity markets to individual domestic equity portfolios. Brière et al. (2012) reject contagion for fixed-income assets, detect contagion effects at the 5% level in stocks, and finally conclude that contagion is an artifact caused by globalization. A similar result (but no similar interpretation) has been provided by Forbes and Rigobon (2002), and Rigobon (2002b, 2003) who find little evidence of shift contagion during the Mexican, Asian, and Russian crises in several emerging markets, as well as between 1994 and 1999 in the Argentinean and Mexican bond markets. Instead, they find a continued high level of correlation during calm periods which they interpret as interdependence.

Beirne and Gieck (2012) provide an empirical assessment of interdependence and contagion across bonds, stocks, and currencies for over 60 economies over the period 1998 to 2011. Their findings indicate that interdependence is most notable across advanced and emerging economies, in the case of the equity market, while contagion effects are most apparent in Latin America and Emerging Asia. However, they also find evidence of contagion from global bonds to regional stocks in Central and Eastern Europe, Middle East and Africa regions. Interdependence within the bond market applies mainly to the advanced economies, whereas evidence for bond market contagion is found for Mexico, Venezuela and Philippines. Cross-market interdependence and contagion from global equities and global currencies to local bonds is not prevalent. Finally, exchange rate interdependence is important for advanced economies, whereas contagion is present in domestic currencies in Hong Kong, Korea, Thailand, Slovakia and Australia that are susceptible to global currency shocks.

Beirne et al. (2013) apply the concept of shift contagion to the analysis of spillovers from mature to emerging stock markets and test for shifts in the transmission mechanism during episodes of extreme movements in mature markets. Their analysis covers a large sample of 41 emerging market economies in Asia, Europe, Latin America, and the Middle East. They show that spillovers from mature markets influence the dynamics of conditional variances of returns in emerging stock markets, and that the spillover parameters change during turbulent episodes in mature markets.

3. European sovereign debt crisis: the facts

The euro area faces a severe sovereign debt crisis due to rising debt levels and government deficits that led rating agencies to downgrade the long-term fiscal sustainability of several euro countries. The euro sovereign debt crisis finds its origin in Greece. Greece's access to international financial markets at low rates after entering the Economic and Monetary Union (EMU), the weak enforcement of European Union (EU) rules concerning debt ceiling, and the

structural rigidities in its economy, led to the accumulation of high levels of external debt (Nelson et al., 2010)³. Lower interest rates allowed the country to refinance debt on more favorable terms and also spurred a spending splurge, and as a result the government sector grew rapidly until 2008. Definitely, the country was not prepared to weather the 2008 global financial crisis and the gradual loss of competitiveness in 2009 began to erode economic growth.

Beginning in 2009, Greece became the center of a severe financial crisis. Toward the end of October 2009, bond yields rose significantly and benchmark bond prices fell, following the country's sovereign debt downgrade by Fitch to A- from A, and Moody's announcement that Greece's debt rating should be placed on review for a possible downgrade (Papavassiliou, 2014). This downgrade was the result of the revelation by the Greek government of a revised budget deficit of 12.7% of GDP for 2009 which was double of the previous estimate⁴. A second development in November 2009 that disrupted the tranquility of European financial markets and led to increased risk aversion was when Dubai World conglomerate asked creditors for a six-month standstill on its debt obligations.

The sovereign spreads of the majority of the euro area countries rose sharply, even on bonds issued by countries with strong fiscal fundamentals, such as Finland, Austria, and the Netherlands. The Greek crisis intensified during 2010-2011 resulting in Greek, Irish, and Portuguese spreads to hit 1,600, 1,200, and 1,100 basis points, respectively (De Santis, 2012). Dellas and Tavlas (2012) mention that by early 2012, the Greek-German spread widened to around 4,000 basis points making the Greek debt burden unsustainable. Till mid-2012 the Greek economy contracted by a cumulative 20 per cent and the unemployment rate reached 25 per cent. Greece had to resort to three successive adjustment programs in order to restructure its debt, since the creation of the European Financial Stability Facility (EFSF) on May 9, 2010. Measures taken include an enormous three-year emergency rescue package for Greece of 110 billion euros, as well as a European stabilization package of 750 billion euros for countries that may need financial assistance in the future⁵.

It was feared that the Greek debt restructuring could lead to a European banking crisis, since major banking institutions in Germany and France had high exposure to Greek debt (see Mink and de Haan, 2013 for a detailed discussion). In November 2010 Ireland became the second country to obtain a rescue package of 85 billion euros from the EU-International Monetary Fund (IMF) rescue mechanism, and serious concerns were raised about the risk of spillover effects to the rest of the world. Irish banks pumped vast amounts of money into a property bubble that simply burst. Soon after, Portugal, Spain and Cyprus became a prime

³ Nelson et al. (2010) mention that according to the Stability and Growth Pact adopted in 1997 by all EU members, budget deficits should not exceed 3% of GDP and debt should remain below 60% of GDP. They also mention that according to the OECD, Greek public administration spending as a percentage of total public expenses was the highest among all OECD countries in 2004, and Greek government expenditures accounted for 50% of GDP in 2009.

⁴ In April 2010, Eurostat estimated Greece's deficit to be even higher, at 13.6% of GDP.

⁵ Reform efforts by the Greek government proved inadequate to allow the country to access international markets in 2012. In February 2012, the Greek government announced the key terms of the so called Private Sector Involvement (PSI), a transaction expected to include private sector holders of approximately EUR 206 billion aggregate outstanding face amount of Greek bonds – excluding Treasury Bills. A successful PSI transaction was required to bring the country's debt-to-GDP ratio on a downward path reaching 120.5% by 2020, and was deemed essential for the implementation of its economic reform programme.

concern for the eurozone due to enlarged fiscal problems and difficulties in supporting their banking sector and requested a bailout from the European authorities. Many analysts have pointed to the problems associated with a common currency but different national fiscal policies. Undoubtedly, the European sovereign debt crisis has revealed that the fiscal and monetary policy framework of the EMU is incomplete and insufficient to prevent a sovereign debt crisis and correct imbalances (Baltas, 2013).

4. Contagion during the European sovereign debt crisis

What about the current European sovereign debt crisis? What does academic research say about the existence of contagion within the euro area or abroad? Forbes (2013) argues that a variety of factors linking countries through trade and banking have increased more rapidly within the euro area than in other economies. Thus, high levels of interdependence and contagion within the euro area, as well as contagion from the euro area to other countries should be expected.

Missio and Watzka (2011) analyse the correlation structure of Greek, Portuguese, Spanish, Italian, Dutch, Belgian and Austrian bond yield spreads over the German yield to study contagion in the euro area. Their results indicate the presence of contagious effects spreading from Greece mainly to Portugal, Spain, Italy and Belgium. They also show that negative rating announcements for Greece have generated contagious effects to Portugal and Spain. De Santis (2012) finds clear evidence of spillover effects. A ratings change in one country significantly affects the sovereign credit spreads of other countries. One-notch downgrade of sovereign bonds in Greece, Ireland and Portugal is associated with an increase in spreads in the bonds of other countries with weak fundamentals. The spillover effect from Greece points to contagion risk hitting Ireland, Portugal, Italy, Spain, Belgium and France, whereas Ireland's spillover effect is not as large and intense but it also hits countries with the weakest fiscal fundamentals.

Arghyrou and Kontonikas (2012) provide evidence that the majority of EMU countries had experienced contagion from Greece, especially Ireland, Portugal and Spain. They interpret this finding as evidence that the Greek bond yield has become a proxy for the systemic risk of the EMU region. Aizenmann et al. (2012) analyze the effects of the global financial crisis and the euro debt crisis on stock and bond market indexes in developing countries, up to end-2011. They find that responses in developing countries to euro crisis events are smaller than for the global financial crisis and that the effect is larger in countries having a higher trade exposure to the euro area. Metiu (2012), investigate sovereign risk contagion in the eurozone between 2008 and 2012, and finds significant cross-border contagion among long-term bond yield premia since the outbreak of the global credit crisis.

Kalbaska and Gątkowski (2012) investigate the dynamics of the credit default swap (CDS) market of PIIGS, France, Germany and the U.K. for the period of 2005–2010. They demonstrate that there was contagion effect since correlations and cross-country interdependencies increased after August 2007. They also provide evidence that Greece and the other PIIGS have lower capacity to trigger contagion than the core EU countries, and that Portugal is the most vulnerable country in the sample, while the U.K. is the most immune to

shocks. Grammatikos and Vermeulen (2012) test for the transmission of the 2007–2010 financial and sovereign debt crises to fifteen EMU countries. They show that even though the sovereign debt crisis affects the group of EMU countries most exposed to a default risk, financials across other EMU countries are also affected due to the many financial interlinkages. Claeys and Vašíček (2012) analyze the bilateral linkages between EU sovereign bond markets over time using forecast-error variance decompositions from a VAR with daily data since 2000 on the sovereign bond yield spreads of the EU countries. Their results indicate the presence of significant spillovers among the sovereign bond markets of EU countries that have intensified during the financial crisis, suggesting the presence of contagion. They also find that sovereign rating news contains some new information and has a significant impact on spreads, and in most cases the spillover running from spreads to rating decisions is even stronger.

Samitas and Tsakalos (2013) investigate the relationships between the Greek stock market and seven European stock markets and propose the asymmetric DCC model as well as copula functions to measure financial contagion. The results of their study provide support to the contagion phenomenon despite the lower than expected impact. Philippas and Siriopoulos (2013) investigate contagion among six European Monetary Union bond markets during the Greek debt crisis period. Their econometric framework contains two procedures, a spillover regime-switching model and a time-varying copula model. Their empirical evidence confirms contagion appetite among countries but not an overall contagion effect from the crisis country to all others. Calice et al. (2013) using a time-varying vector autoregression framework find substantial variation in the patterns of the transmission effect between maturities and across countries during the 2009-2010 crisis period. Their major result is that, for several countries including Greece, Ireland and Portugal, the liquidity of the sovereign CDS market has a substantial time varying influence on sovereign bond credit spreads.

Stracca (2013) finds that euro debt crisis events have had sizeable effects on global markets outside the eurozone leading to a rise in global risk aversion. He argues that the trade and economic relations with the eurozone constitute the most important channels of contagion, which is statistically significant and sizeable for all assets except exchange rates. Financial integration with the euro area is generally found to be insignificant as a conduit of contagion. Finally, countries' own riskiness is found to matter for bonds and exchange rates, whereby contagion is reduced for safer countries. Papavassiliou (2014) analyzes the correlation degree between Greek stocks and sovereign bonds during the Greek sovereign debt crisis period. Using Forbes and Rigobon (2002) cross-market correlation coefficient as well as the Dynamic Conditional Correlation (DCC) approach proposed by Engle (2002), he concludes that the correlation between stock and sovereign bond returns has increased during the Greek debt crisis period and contagion has occurred. This result implies that the prices of stocks and bonds fall jointly during periods of turmoil in the government bond market and indicates a flight to less-risky assets or a flight to other countries.

Bhanot et al. (2014) examine whether news about the Greek debt crisis have led to spillovers in the financial sector of Greece, Italy, Portugal, and Spain. They show that there is a substantial increase in the spillover from the Greek bond market on the days when there are announcements of Greek ratings downgrades or when there is generally good news from the IMF or other multilateral agencies. They also find evidence of direct spillover from the Greek bond market to other country stock markets via increases in the spreads of the domestic bond market. Vítor Constâncio, Vice-President of the ECB, in his keynote lecture at the

Bocconi University/Intesa Sanpaolo conference on “Bank Competitiveness in the Post-crisis World” in October 2011, argues that there is significant evidence of actual contagion effects during the euro debt crisis, despite the crisis management measures that have been taken. There is ample evidence on contagion between government debt markets and banking institutions that are exposed to sovereign debt. As he describes, developments in the CDS spreads of Greece, Ireland, Portugal, Italy and France are able to explain an increasing share of the variability in the CDS spreads of several banks, such as Credit Agricole and Société Générale.

5. Policy implications and suggestions for country-level reforms

EU’s sovereign debt crisis has numerous broader policy implications. It has raised concerns about imbalances within the eurozone which, although enjoys a common monetary policy, it has diverse national fiscal policies. EU’s crisis in general can have several implications for other countries such as the United States. Nelson et al. (2010) refer to several policy implications the eurozone crisis has for all EU countries as well as for other countries with strong economic ties with the EU. First, falling investor confidence in the eurozone can widen the U.S. trade deficit combined with a weakened euro. The strong economic linkages between U.S. and the EU automatically mean that a financial crisis in the EU can easily impact the U.S. economy. Second, a large amount of Greece’s debt in the form of fixed-income securities is held by foreign investors and a possible Greek default would have direct severe consequences for these creditors. Third, imbalances within the eurozone are similar to imbalances in U.S. and China and reiterate how financial policies in one country can impact other countries’ economies. Fourth, a possible Greek default or a default from another EU country raises concerns about contagious spillovers to the rest of EU countries and other countries outside EU borders.

The importance of contagion can be seen from two different points of view. Pericoli and Sbracia (2003) explain that from the investment management perspective, we care about contagion because knowing whether the relationship between two or more assets is stable through time is important for successful diversification strategies. On the other hand, from a macroeconomic point of view knowing the mechanisms via which financial shocks are transmitted, would be beneficial to regulators and policy makers that design fiscal and monetary policies. For example, if financial shocks are transmitted via temporary channels, regulators could use short-run strategies such as stricter capital controls to reduce contagion effects. On the contrary, if shocks are transmitted via more permanent channels, any short-term measures will only delay and not prevent contagion among countries and markets. According to Pericoli and Sbracia (2003) the banking system of a country can contribute to the dissipation of contagion through bank panics and the moral hazard caused by the presence of institutionally enforced guarantees on deposits and the fluctuations in the value of assets held as collateral by banking institutions. If banks react by rebalancing their portfolios, a credit crunch can occur in other countries via the so-called *common lender effect*. The credit ratings that are used by regulators to determine the capital requirements of banks, can seriously impact the composition of bank portfolios of assets since only highly

rated assets can qualify as eligible collateral to obtain credit from national central banks or the European Central Bank (ECB) (De Santis, 2012).

In the words of Vítor Constâncio, contagion is a form of systemic risk and instability that plays a crucial role in exacerbating the sovereign debt problems in the euro area. As a consequence, regulators and policy makers should establish effective policy measures that will mitigate the adverse effects of contagion. There are various measures that can be taken by ECB to deal with contagion, namely: (a) the “enhanced credit support”, a series of measures to strengthen the flow of credit in the market, such as the fixed rate tender with full allotment, the provision of liquidity at longer maturities, the provision of more liquidity in foreign currency to euro area banks, and the purchase of covered bonds (b) the extension of the list of eligible assets for collateralization, (c) the establishment of the Securities Markets Programme (SMP) under which the Eurosystem buys securities in dysfunctional market segments in order to protect the smooth transmission of monetary policy (d) the continuous application of fixed rate full allotment procedures in all monetary policy liquidity operations (e) the Covered Bond Purchase Programme. Vítor Constâncio suggests that the EU governments must adopt and implement medium-term fiscal consolidation plans and introduce structural reforms to make their economies more competitive. Along these lines, ECB has also welcomed the adoption of the so-called “six-pack” of new rules.

De Santis (2012) refers to the development of international standards aiming to reduce a country’s vulnerabilities to financial crises in the future and to strengthen macroeconomic policies and financial mechanisms. These standards cover various issues such as banking system regulation, corporate governance, data dissemination, and enhanced transparency in all monetary, fiscal and accounting policies. Arghyrou and Kontonikas (2012) among others, argue that countries that have been hit by a crisis should regain the confidence of international markets that they are committed to permanent and radical improvement in their macroeconomic fundamentals. In the absence of solid signals that the distressed economies are determined to implement the necessary reforms, international financial markets will continue to doubt their long-term debt sustainability and keep them isolated from the rest of the world. Arghyrou and Kontonikas (2012) propose institutional reforms in mainly two directions. First, the eurozone should develop effective mechanisms of fiscal supervision and policy co-ordination. Second, the spreading of a crisis within the affected country and to other countries should be prevented through the creation of an EMU-run permanent mechanism of emergency financing, which has to be transparent enough and its terms should eliminate the risk of moral hazard.

Forbes (2013) argues that policies aimed at mitigating contagion should be evaluated using the same criteria as for other countries. However, the way eurozone is structured today creates additional considerations due to the lack of an independent currency and of a traditional lender-of-last resort that would support the large bank exposures. Also, another consideration is eurozone’s current structure of sharing liabilities through institutions such as ECB, EFSF and the European Stability Mechanism (ESM), that can trigger contagion through wake-up calls about the members’ fiscal situation. Forbes (2013) proposes long-term and short-term measures to deal with contagion that are implemented through four main channels: trade, banking, portfolio investors and macroeconomic fundamentals-wake-up calls. Long-term measures include: (a) traditional macroeconomic tools that deal with contagion through trade, since this form of contagion is more predictable and moderate (b) limitation of leverage and the enforcement of stricter capital requirements to banks (c)

support of investments abroad and balancing of portfolio liabilities by portfolio assets *(d)* prioritize addressing fundamental economic weaknesses that may not appear urgent today.

Short-term actions to mitigate contagion include: *(a)* reforms to boost the country's competitiveness through the trade channel *(b)* guaranteeing bank deposits and providing liquidity to banks *(c)* capital controls and guaranteeing assets through portfolio investors *(d)* credible announcements of reforms to strengthen fundamentals. Definitely, the smooth and efficient implementation of the aforementioned policies is hindered by the unique characteristics of the eurozone that should be considered by policy makers.

6. Conclusions

Academic research has provided enough evidence for the existence of contagion within the eurozone and internationally, during periods of financial distress. EU's sovereign debt crisis has raised serious concerns about eurozone's imbalances and its vulnerability to major global financial shocks. Understanding financial contagion and the channels and mechanisms through which it spreads and evolves is extremely difficult, mainly due to complicated econometric issues but also due to difficulty in isolating and analyzing interactions among diverse financial markets and countries with different fiscal fundamentals.

Although there are various policies at hand ready to mitigate the adverse effects of contagion, or even better prevent the contagious effects from happening, their effectiveness is highly questioned. Although various corrective steps can be taken to deal with contagion, recent history has shown that there are no easy solutions especially in integrated economies like the ones operating within the EU.

Contagion's diversity of definitions provides different conclusions and policy recommendations and great difficulty in classifying market shocks. As Kristin Forbes successfully argues, policy makers and regulators should pay careful attention to the externalities their corrective actions may have on other economies and try to avoid measures that increase fiscal liabilities and trigger additional contagion.

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HELLENIC FOUNDATION FOR EUROPEAN & FOREIGN POLICY

49, Vas.Sofias Ave. 10676 Athens Greece | Tel. +30 210 7257 110 | Fax +30 210 7257 114 | E-mail

crisisobservatory@eliamep.gr