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Contagion effects in selected European capital markets during the financial crisis of 2007–2009

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ABSTRACT

The empirical research that is presented here deals with the process of contagion in selected capital markets during the financial crisis of 2007–2009. The values of stock market indices provide the most concise information about the situation in the capital market (the German Dax, the French CAC, the British FTSE100 and the Polish WIG20). The definition of contagion which has been adopted here and which is verified by using cospectral analysis assumes that contagion amounts to a significant intensification of lagged reactions (i.e. a phase shift of selected harmonic components). This approach does not assume that frequencies are divided into high and low bands according to a predetermined schema, which means that this division can be different for each pair of the analysed markets. The research that was carried out indicates that rates of return in the studied European markets react simultaneously to a much greater extent as a result of interdependencies than as a result of mutual contagion.

1. Introduction

The concept of market contagion was introduced in the 1990s in order to distinguish between the classical transmission of a crisis which occurs via real links (mainly through international trade) and crisis transmission in financial markets. However, the process of contagion itself is still not clearly understood (Dornbusch et al., 2000).

Some authors believe that contagion results from fundamental (real and financial) links, and then it is referred to as fundamentals-based contagion (e.g. Calvo and Reinhart, 1996). Kaminsky and Reinhart (2000b) have organised the channels of crisis transmission for financial links. The authors point out that it is not geographical proximity that plays a major role in transmitting crisis impulses and that the relationships with a financial centre or between markets are much more important. These authors present three possible crisis transmission patterns. As for the first pattern, a crisis omits a financial centre and is transmitted via bilateral connections between peripheral markets. The second pattern involves the transmission of a crisis through a financial centre, which may result, for example, from the dependence of two markets on the same, single lender. The third pattern occurs when a shock is generated in a financial centre and then influences those markets that are linked through the same centre.

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Those contagion effects that go beyond fundamental links and are referred to as pure contagion (e.g. Eichengreen et al., 1996) can be observed as a result of financial shocks and the spread of uncertainty or investors' behaviour which is difficult to predict. These effects can occur both in markets that are significantly interconnected and in those that are not connected financially. However, the existing financial links amplify the contagion effect, which contributes to the transmission of a crisis.

Investors' herding behaviour, i.e. an orientation to the reactions of others, as well as panic and a self-fulfilling prophecy are most often mentioned among the causes of contagion in markets (pure contagion). The literature emphasises that such behaviour among investors is, to a large extent, caused by information asymmetry.

However, researchers agree that the transmission of a crisis in financial markets results both from financial links between these markets and from pure contagion itself. The problem is how to distinguish between the effects of these processes.

This paper presents a discussion of this issue and uses the original proposal to separate the two processes based on the example of data from the capital market. A crisis in the capital market is identified with a sudden, sharp decline in stock prices which lasts for a relatively long period of time. The values of stock market indices provide the most concise information about the situation in the capital market.

The definition of contagion that has been adopted here and is verified by using cospectral analysis assumes that contagion means a significant intensification of lagged reactions (i.e. a phase shift of selected harmonic components).

The plan of this paper is as follows. Research approaches and a review of the literature are described in Section 1, whereas the basic tools of cospectral analysis that were used for the purpose of this paper are presented in Section 2. Section 3 describes the present empirical studies, Section 4—statistical tests and Section 5 presents a discussion of the results of these studies. The paper closes with a summary and a list of essential references.

2. Research approaches and a review of the literature

The basic problem associated with studying contagion effects in the financial market is how to measure these effects (which method to use). If one assumes that it is shocks going beyond financial or economic (fundamental) links that are to be studied, then one should think which model would be best for this purpose. If correlation analysis is to be used, it should be remembered that correlation may increase not only as a result of contagion but also because of the dependencies between markets (Rigobon, 2002; cf. definitions provided by the World Bank[1]).

Research studies usually focus on confirming the significance of selected contagion channels. At the same time it is assumed that every research method and every econometric model should control for economic and financial connections in some way.

Most studies that are described in the literature employ classical time-domain analyses and they usually use methods that test changes in correlation coefficients (King and Wadhwani, 1990; Lee and Kim, 1993; Calvo and Reinhart, 1996; Forbes, Rigobon, 2002) as well as structural VAR models (Favero and Giavazzi, 2002), the ARCH and GARCH models (Hamao et al., 1990; Edwards and Susmel, 2001; Inagaki, 2007; Billio and Caporin, 2010), DCC–GARCH models (Wang and Thi, 2006; Cappiello et al., 2006; Frank et al., 2008; Wang and Moore, 2012), cointegration analysis (Longin and Solnik, 1995; Cashin et al., 1995), probit and logit models (Eichengreen et al., 1996; Kaminsky and Reinhart, 2000a; Glick and Hutchison, 2001; Falcetti and Tudela, 2006), regime-switching models (Gallo and Otranto, 2008), factor models (Corsetti et al., 2005; Dungey et al., 2005, 2007; Luchtenberg and Vu, 2015) and a copula approach (Costinot et al., 2000; Rodriguez, 2007; Horta et al., 2010).

However, none of the approaches is able to completely resolve the issue of how to differentiate classical crisis transmission from contagion. Which approach can allow one to better monitor the transmission of unexpected shocks remains an open question.

Frequency-domain cospectral analysis and wavelet analysis are contemporary tools for discriminating between particular changes that occur in financial markets during a crisis as a result of financial links and pure contagion effects (Bodart and Candelon, 2009; Orlov, 2009; Rua and Nunes, 2009; Graham and Nikkinen, 2011; Gallegati, 2012; Graham et al., 2012; Kiviaho et al., 2014; Madaleno and Pinho, 2012; Loh, 2013; Ranta, 2013; Ftiti et al., 2015; Burzala, 2014; Dimic et al., 2016). These methods make use of economies of scale and link contagion to high-frequency (short-term) fluctuations. The range of these fluctuations is slightly different according to different authors—from several days (Baig and Goldfajn, 1998; Ait-Sahalia et al., 2015) to two weeks (Orlov, 2009). In each case the researchers justify the reasons for taking this approach by mentioning that markets' reaction to financial shocks subsides within a short period of time.

All of the above-mentioned research methods focus on analysing comovements, which means that they are based on the assumption that financial markets' reactions are immediate. When the direction of contagion is established, inference is supported by causality tests or expert opinions.

For the purpose of the empirical research that is described later in this paper, it has been assumed that simultaneous changes in rates of return in two markets (comovements) occur as a result of the interdependence (financial links) between these markets or in response to events taking place in so-called third-country markets. The process of contagion that spreads, for example, from one market to another is the result of a crisis or contagion effects occurring in the first market. Therefore,

[1] http://www.worldbank.org/economicpolicy/managing%20volatility/contagion/definitions.htm.