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Contagion and dynamic correlation of the main European stock index futures markets: a time-frequency approach

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Abstract

In this paper, we examine the financial contagion and dynamic correlation between three European stock index futures, namely FTSE 100, DAX 30 and CAC 40. For this purpose we resort to a continuous wavelet transform framework and we cover the aftermath of the sovereign debt crisis period. More precisely, we analyze the power spectrum of the series, the wavelet coherency and the average dynamic correlation before and after turbulence episodes occurred after the outburst of the sovereign debt crisis. Our results show that the stock index futures are highly correlated and this correlation increases around financial distress episodes. The contagion phenomenon, associated with a high-frequency correlation, manifested especially after the additional rescue package awarded to Greece. All in all, the dynamic correlation is influenced by the frequency decomposition level and fluctuates considerably in the very long-run.

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Keywords: Stock index futures; European financial markets integration; Portfolio diversification; Contagion; Wavelets

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1. Introduction

The stock markets integration has drawn attention among academics, practitioners and policy makers, especially at the European Union (EU) level. Numerous studies have focused on the cross-border interdependence, analyzing the co-movements and contagion between spot markets. This issue has lately gained importance at least for the following reasons. First, the co-movement of stock market returns is crucial for portfolios risk assessment, which highlights the necessity of diversifying investments, so as to disperse the risks. The benefits of risks diversification are higher when the correlation between the stock returns is low. Noteworthy studies addressing this topic are those of Ruaand Nunes (2009), Sergey et al. (2010), Syllignakisand Kouretas (2011) and Dajcman et al., (2012).

Second, stock markets co-movements and correlations provide particular clues about spillover effects. This issue is important for risk managers because the transmission of shocks among financial markets is assumed to be higher in times of crisis (Dimitriou et al., 2013). In this line, most of the research studies discovered that correlations between markets were growing during and after periods of high volatility (Longin and Solnik, 1995;Morana and Beltratti, 2008; Tamakoshi and Hamori, 2013). Finally, studying the stock markets correlation is important also for supervision authorities and international financial institutions (Ahmad et al., 2013). Additional information is released, allowing the policy makers to undertake coordinated rescue measures for contagious financial systems.

Even if a large part of the literature showed that international market are more and more correlated and the co-movements increase in high volatility periods, there are also studies which provided mixed results. This is due to the way of defining contagion and/or to the econometric techniques employed in this demarche. In the last years, a general accepted definition of the contagion has emerged, being advanced by Forbes and Rigobon (2002). Accordingly, the contagion is associated with a significant increase in the degree of co-movements among financial markets, during and immediately after episodes of high financial turbulence. In addition, an ample development of the empirical techniques was recorded. Nowadays, most of the papers rely on the Dynamic Conditional Correlation (DCC) model proposed by Engle (2002), which has emerged from the autoregressive conditional heteroskedasticity (ARCH) model. Cappiello et al. (2006) developed this technique and proposed an asymmetric approach called Asymmetric Dynamic Conditional Correlation (ADCC) model. Important studies which used these methods both for developed and emerging stock markets, especially in the context of the recent financial crisis, are those of Chen et al., (2002), Chiang et al., (2007), Lin (2012), Min and Hwang (2012) and Ahmad et al., (2013). The European stock markets represented a case study for the works of Voronkova(2004), Hardouvelis et al., (2006), Syllignakisand Kouretas (2011) and Connor and Suurlaht (2013).

In this context, the contribution of our paper to the literature is threefold. First, we assess the contagion and dynamic correlation of futures and not spot markets. The use of stock index futures prices has several obvious advantages Pan and Hsueh (1998). On the one hand, it overcomes the nonsynchronous problem existing on the spot markets. However, this issue is not of great interest for the present study, as only the European stock markets are analyzed. On the other hand, the general sentiment is that the price discovery takes place in stock index futures markets instead of occurring in underlying spot markets. Recently, Karimand Jais(2011) studied the effect of the subprime crisis on the integration of stock index futures markets and discovered that the 2007 subprime crisis does not seem to affect the long-run co-movements among the stock index futures markets.

Second, our paper employs a novel approach, namely the Continuous Wavelet Transform (CWT). The wavelet transformation, which combines the time and frequency domain, was used in several researches approaching the co-movements of international stock markets. This method is very useful in portfolio management analysis, where agents focusing on daily movements interact, on the markets, with agents concerned with longer time horizons. Notable studies in this area are those ofRua and Nunes (2009), Graham and Nikkinen(2011), Graham et al., (2012), Dajcman et al., (2012) and Ranta(2013). However, none of these studies addressed the correlation of futures markets.

Third, we focus on the recent period, covering the years after the start of the sovereign debt crisis. Most of the previous empirical works addressed the Asian or the subprime crisis episodes. Nevertheless, the period following the sovereign debt crisis is of particular interest for the European stock markets. Consequently, we focus on the three largest markets in order to see to what extent the identified turbulence episodes (associated with rescue decisions or rating downgrades) impacted upon their dynamic correlation level.

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