Accepted Manuscript

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Please cite this article as: J.M. Polanco-Martínez, J. Fernández-Macho, M.B. Neumann, S.H. Faria, A pre-crisis vs. crisis analysis of peripheral EU stock markets by means of wavelet transform and a nonlinear causality test, *Physica A* (2017), http://dx.doi.org/10.1016/j.physa.2017.08.065

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A pre-crisis vs. crisis analysis of peripheral EU stock markets by means of wavelet transform and a nonlinear causality test

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Abstract

This paper presents an analysis of EU peripheral (so-called PIIGS) stock market indices and the S&P Europe 350 index (SPEURO), as a European benchmark market, over the pre-crisis (2004–2007) and crisis (2008–2011) periods. We computed a rolling-window wavelet correlation for the market returns and applied a non-linear Granger causality test to the wavelet decomposition coefficients of these stock market returns. Our results show that the correlation is stronger for the crisis than for the pre-crisis period. The stock market indices from Portugal, Italy and Spain were more interconnected among themselves during the crisis than with the SPEURO. The stock market from Portugal is the most sensitive and vulnerable PIIGS member, whereas the stock market from Greece tends to move away from the European benchmark market since the 2008 financial crisis till 2011. The non-linear causality test indicates that in the first three wavelet scales (intraweek, weekly and fortnightly) the number of uni-directional and bi-directional causalities is greater during the crisis than in the pre-crisis period, because of financial contagion. Furthermore, the causality analysis shows that the direction of the Granger cause-effect for the pre-crisis and crisis periods is not invariant in the considered time-scales, and that the causality directions among the studied stock markets do not seem to have a preferential direction. These results are relevant to better understand the behaviour of vulnerable stock markets, especially for investors and policymakers.

Keywords: **Non-stationary time series; nonlinear causality test; MODWT; PIIGS; rolling-window wavelet correlation.**

1. Introduction

International stock markets have become the focus of increasing empirical research in recent years. Of particular interest has been the analysis of European stock markets [10, 22, 29, 70], with special attention to stock markets that belong to the European Monetary Union (EMU) [25, 27, 33, 70]. A better knowledge of these stock markets is of vital importance for investors, economists and policymakers, seeing that the economic crisis

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