Clustering Correlation between Crude Oil and National Stock Markets

Andre Salles*
Federal University of Rio de Janeiro, Rio de Janeiro, Brazil - as@ufrj,br

Maria Eduarda Silva
University of Porto, Porto, Portugal - mesilva@fep.up.pt

Paulo Teles
University of Porto, Porto, Portugal - pteles@fep.up.pt

The stock market plays an important role in collecting money and encouraging investments, providing resources for investment and production financing. Consequently, it is a major component of the financial sector of any economy. Therefore, studying the relevant factors for stock market performance is important to determine the stock market return and economic expectations. Among these factors, the variations of the crude oil price have a crucial role. Crude oil is directly or indirectly present in all productive activities. Therefore, the crude oil price movement is a relevant factor affecting stock market expectations, equity price determination and economic activities in general. Moreover, the financialization of the commodity markets, in particular of the crude oil market in the last three decades, increased the association of these markets with the financial markets. Generally, commodity and financial markets present co-movements. The same certainly occurs with the crude oil markets and the stock market, mainly because of the globalization of these markets. The aim of this work is to study the relationship between crude oil prices and national stock markets. Thus, this study has two purposes. First, it examines the association between national stock market index returns and crude oil price variations. Second, it searches for similarities among these associations. To achieve the first purpose, stochastic models for volatility and conditional correlation were used for the closing quotations of selected national stock market index and crude oil prices returns. To estimate the variance or volatility and covariance two bivariate models were implemented. To estimate the correlation time series, bivariate diagonal vech multivariate generalized autoregressive conditional heteroskedasticity models were fitted. With the purpose of identifying similarities in the correlation time series, hierarchical clustering algorithms were considered. The data used are the weekly close quotations in US$ of the representative aggregate stock market indexes from 48 different countries, a global stock market index and the Brent crude oil price. The sample spans the period from January 2nd, 2004 to October 3rd, 2014.

Keywords: Stock Market; Crude Oil Prices; Dynamic Correlation; Hierachical Cluster.