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Asymmetric responses of international stock markets to trading volume

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Abstract

The major goal of this paper is to examine the hypothesis that stock returns and return volatility are asymmetric, threshold nonlinear, functions of change in trading volume. A minor goal is to examine whether return spillover effects also display such asymmetry. Employing a double-threshold GARCH model with trading volume as a threshold variable, we find strong evidence supporting this hypothesis in five international market return series. Asymmetric causality tests lend further support to our trading volume threshold model and conclusions. Specifically, an increase in volume is positively associated, while decreasing volume is negatively associated, with the major price index in four of the five markets. The volatility of each series also displays an asymmetric reaction, four of the markets display higher volatility following increases in trading volume. Using posterior odds ratio, the proposed threshold model is strongly favored in three of the five markets, compared to a US news double threshold GARCH model and a symmetric GARCH model. We also find significant nonlinear asymmetric return spillover effects from the US market.
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1. Introduction

As a result of globalization, de-regulation and advances in information technology, the modern theory of international markets has switched from the traditional view of market segmentation to the concept of market integration. A substantial amount of research emphasizes the co-movements of international stock markets and explores the dynamics of return co-variances and spillover effects between markets. For example, Jaffe and Westerfield [1] provide empirical evidence of a significant direct spillover effect among some national stock markets, while Eun and Shim [2] find return spillover effects among national markets and an influential role of the US market on the cross-country market index series. Ross [3] argues further that information from one stock market can be incorporated into the volatility process of other stock markets. Hamao et al. [4], Theodossiou and Lee [5], Chiang and Chiang [6] and Martens and Poon [7] subsequently find supporting evidence for volatility spillover among major stock markets.

There is also substantial evidence in the literature that stock markets react asymmetrically to market news results. This phenomenon was first discovered by Black [8] and Christie [9] who discuss the leverage effect as the cause of higher volatility following negative stock returns; similar to the market over-reaction hypothesis discussed in Ref. [10]. There is also the volatility feedback hypothesis which says that higher volatility causes stock prices to fall. Many models have been developed to capture types of asymmetric behavior, most fit into the threshold GARCH framework. Glosten et al. (1993) employ a threshold GJR-GARCH model and find evidence that local negative market news causes increased market volatility [47]. This finding is confirmed in studies by Koutmos [11], Nam et al. [10] and Brooks [12], using double threshold models. These papers also find evidence of faster mean reversion dynamics following local market bad news. More recently, Chen et al. [13] employ a double-threshold GARCH model with a US market threshold variable, to explore the dynamics of daily stock-index returns for six international markets from 1985 to 2001. Their results provide strong evidence supporting an asymmetric nonlinear spillover effect from the US market to other markets in Europe and Asia. The US market news transmits asymmetrically, around a threshold value, to each of the national stock markets considered with average volatility in each national market much higher following bad US news. Further, Chen and So [14] explore a range of international markets to use as exogenous threshold values in a double threshold GARCH model. They find that the Japanese market has little spillover or threshold nonlinear effect on mean returns in Asian markets, in comparison with the US market. These results are supported by Wang and Firth [15], who find the emerging market of China does not exhibit significant spillover effects to other markets worldwide, including those in Asia. The US return has thus evolved as the preferred threshold variable in the examination of return spillover and nonlinear asymmetric effects.

However, this previous work ignores the possible correlation between the stock price or return and trading volume. Numerous financial studies have documented this important relationship. Clark [16] and Epps and Epps [17] suggested that trading