Trading volume and stock market volatility: The Polish case

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Abstract

Relying on the mixture of distributions hypothesis (MDH), this paper investigates the relationship between daily returns and trading volume for 20 Polish stocks. Our empirical results show that in the majority of cases volatility persistence tends to disappear when trading volume is included in the conditional variance equation, which is in agreement with the findings of studies on developed stock markets. However, we cannot confirm the testable implications of the MDH in all cases, which indicates that future research on the causes and modeling of Polish stock market volatility is necessary.
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1. Introduction

Recent studies on the volatility of stock returns have been dominated by time series models of conditional heteroscedasticity and have found strong support for GARCH effects. These findings are important to the field of applied finance for at least three reasons. First, the estimated return variances are used as risk measures and enter directly into Black–Scholes-type derivative pricing formulas. Second, heteroscedasticity must be taken into account for tests of market efficiency to produce reliable test statistics. Third, most asset pricing theories relate expected returns to the joint second-order movements of returns as well as to other

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stochastic processes; therefore, efficient estimating and testing must take into account the heteroscedasticity property of returns.

While a large number of studies have found evidence in favor of GARCH effects in stock returns, there is no consensus on the underlying economic explanations for the autoregressive effect on the conditional variance. One of the possible theoretical explanations is the mixture of distributions hypothesis (MDH) put forward by Clark (1973), Epps and Epps (1976), and Tauchen and Pitts (1983) and more recently by Lamoureux and Lastrapes (1990).[1] According to the MDH, a serially correlated mixing variable measuring the rate at which information arrives to the market explains the GARCH effect in the returns. This linkage has been documented, among others, for the U.S. stock market by Andersen (1996), Gallo and Pacini (2000), Kim and Kon (1994), and Lamoureux and Lastrapes (1990) and the UK stock market by Omran and McKenzie (2000). In general, the bulk of empirical studies has found evidence that the inclusion of trading volume in GARCH models for returns results in a decrease of the estimated persistence or even causes it to vanish.

While a fair amount of empirical evidence on the daily return–volume relationship exists for developed, highly liquid stock markets in industrial countries, to our knowledge, the current literature does not provide findings on this issue for central and eastern European capital markets.[2] Hence, the purpose of this paper is to provide initial evidence for one of the developing stock markets in central and eastern Europe, namely the Polish stock market.[3] Relying on a sample of 20 individual stocks for the period from January 4, 1999 to October 31, 2000, we investigate the issue of whether GARCH effects in daily stock returns capture the effects of temporal dependence in daily trading volume for stocks in the Polish market. We examine the return–volume relationship for Polish stocks to determine whether there are differences between developed markets and one emerging market.

The paper proceeds as follows: Section 2 outlines the theoretical foundation and the methodology. A description of the data, the empirical results for the Polish stocks, and the findings of existing investigations are contained in Section 3, and Section 4 concludes.

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[1] Alternative explanations are the existence of autocorrelation in the news arrival process (Diebold & Nerlove, 1989), agents' slow adaptation to news (Brock & LeBaron, 1996), market microstructure effects (Bollerslev & Domowitz, 1991), and parameter instability (Tsay, 1987).

[2] The only empirical evidence on the return–volume relationship for an emerging market is provided by Pyun et al. (2000) who investigate 15 individual shares in the Korean stock market. Furthermore, Brailsford (1996) analyzes the effect of information arrivals on volatility persistence in the Australian stock market and Lange (1999) for the small Vancouver stock exchange.

[3] The number of studies on the Polish stock market is limited, focusing primarily on market efficiency and volatility. Gordon and Rittenberg (1995) and Rockinger and Urga (2000) provide evidence on market efficiency and market integration. Kasch-Haroutounian and Price (2001), Scheicher (1999), and Shields (1997) apply various univariate and multivariate GARCH models, and Charemza and Majerowska (2000) analyze the risk reduction effect of price limits.