On the Empirical Linkages between Stock Prices and Trading Activity on the German Stock Market

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Abstract In this study the joint dynamics between stock prices and trading volume are investigated using data from the German stock market. Our results indicate no relations (contemporaneous as well as dynamic) between return levels and trading volume but strong linkages between return volatility and volume data. On including trading volume in the conditional volatility framework (GARCH-type) we provide empirical evidence for the importance of volume data as an indicator for the flow of information on the market. Applying Granger's test for causality we detect also feedback relations between trading volume and return volatility. These findings corroborate our assumption that trading volume indirectly contains information about stock prices due to its relation to return volatility.

1 Introduction

Empirical investigations on stock markets traditionally focus primarily on stock prices and their behavior over time. Conditional upon the available set of information about a company, its stock price reflects investors' expectations concerning the future performance of the firm. The arrival of new information causes investors to adapt their expectations and is the main source for price movements.

However, since investors are heterogeneous in their interpretations of new information, prices may remain unchanged even though new information is revealed to the market. This will be the case if some investors interpret the news as good whereas others find it to be bad. Another situation in which relevant information may leave stock prices unchanged can occur when investors interpret the information identically but start with diverse expectations. From this it follows that changes in stock prices reflect an aggregation or averaging of investors' adapted beliefs.

On the other hand, stock prices may only change if there is positive trading volume. One important question arising from this context is whether volume data are simply a descriptive parameter of the trading process or may contain unique information that can be exploited for modeling stock returns or return volatilities. As with prices, trading volume mainly reflect the available set of relevant information on the market. Unlike stock prices, however, a revision in investors' expectations always leads to an increase in trading volume which therefore reflects the sum of investors' reactions to news. This summation process leading to trading volume preserves differences existing between investors' reactions to the arrival of new information, differences which may get lost in the averaging process that fixes prices. Studying the joint dynamics of stock prices and trading volume therefore improves the understanding of the dynamic properties of stock markets.

Based on the above, a considerable body of literature has emerged which examines the role of trading volume in return formation. Karpoff (1987), Hiemstra and Jones (1994), Brailsford (1996) and Lee and Rui (2002) investigated the relationship between trading volume and price changes per se, mainly using index data. While the results of these studies do differ, on the whole they support the existence of a positive volume-price relationship. The linkage between stock return volatility and trading volume was pointed out, among others, by Karpoff (1987), Brock and LeBaron (1996), and Lee and Rui (2002). These studies uniformly report a strong relationship (contemporaneous as well as dynamic) between return volatility and trading volume. Lamoureux and Lastrapes (1990) were the first to apply stochastic time series models of conditional heteroscedasticity to explore the contemporaneous relationship between volatility and volume data for the US market. The authors find the persistence in stock return variance to vanish for the most part when trading volume is included in the conditional variance equation.

The present study concentrates on the role of trading volume in the process that generates stock returns and return volatilities on the German stock market, namely the stocks of companies listed in the DAX of Deutsche Börse. Unlike most other studies on this issue, we use individual stock data instead of index data. In addition, our investigations cover not only contemporaneous but also dynamic (causal) relationships. This is important, since we are mainly interested in whether trading volume acts as a determinant of stock return levels and/or return volatilities.

The paper is organized as follows: Section 2 outlines the data and provides some basic statistics. Section 3 describes our econometric approach to evaluate the contemporaneous relationship between return series and trading volume. Section 4 extends the analysis by examining dynamic (causal) relations. Section 5 finally summarizes the main results.