Price Discovery and Arbitrage between Futures and Cash Markets for Taiwan Stock Index: An Application of Multivariate Threshold Models

Abstract

In prior research on the arbitrage between futures and cash markets, most studies have focused on the persistence of deviations from the cost of carry using linear econometric methods. Linear methods are valid, however, only under the maintained hypothesis of a linear autoregressive process for the basis, which means that adjustment of the basis toward the equilibrium value is both continuous and of constant speed, regardless of the size of the deviation from the equilibrium value. In many instances, however, the dynamic adjustment of the basis tends to be nonlinear and discontinuous due to transaction costs. Therefore, we cannot identify correctly the impact of basis on assets returns if failing to use the nonlinear model to describe such relationship.

This paper employs the concept of threshold cointegration developed by Balke and Fomby (1997) and uses 5-minute intraday data to re-examine the arbitrage behavior and the function of price discovery in Taiwan stock and futures markets under different levels of transaction costs. The main purpose of this paper is to investigate the nonlinear relationship between the Taiwan futures and cash indexes. We use the methodology of threshold cointegration to analyze the effects of bid-ask spread on the futures and cash indexes and explore the function of price discovery in the futures and cash markets under different arbitrage bounds. In particular, since the threshold value is unobservable, the major contribution of this paper is to employ the multivariate threshold autoregressive model (MTAR) introduced by Tsay (1998) to investigate the dynamic relationship between the Taiwan stock index futures and cash indexes.

In this paper, we find that there exists a nonlinear relationship between futures and cash indexes. Within the arbitrage bounds, the change in basis can affect prices in both markets and a significant feedback relationship between futures and cash markets is noted. Besides, price discovery is not evident in the futures markets due to almost the same speed of information flows in both markets. While outside the arbitrage bounds, the influence of the change in basis on both futures and cash indexes is statistically insignificant and the change in the futures price leads the cash price, thereby indicating notably the function of price discovery in the futures market. As a result, the bivariate model that allows for dynamic interrelationship between futures and cash prices is better than the traditional one in revealing both the price discovery of futures and cash indexes and arbitrage behavior within and outside the arbitrage bounds.
Keywords: Indexes futures ; Price discovery ; Arbitrage ; Threshold cointegration ;
Multivariate threshold autoregressive model