Applied Economics Letters ›
Volume 14, 2007 - Issue 7

Original Articles

On the application of the dynamic conditional correlation model in estimating optimal time-varying hedge ratios

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Pages 503-509 | Published online: 18 Jun 2007

Cite this article https://doi.org/10.1080/13504850500447331

Abstract

This article applies the dynamic conditional correlation model of Engle (2002) with error correction terms in order to investigate the optimal hedge ratios of British and Japanese currency futures markets. For a comparison, the estimates of three other models -- traditional generalized autoregressive conditional heteroskedasticity (GARCH), ordinary least square (OLS) and error correction model (ECM) -- are also reported. Results show that the dynamic conditional correlation model yields the best hedging performance in both futures markets. Nonetheless, the traditional multivariate GARCH model (which exhibits constant conditional correlations and time-varying hedge ratios) performs the worst hedging effectiveness, even inferior to the time-invariant hedging methods (OLS and ECM). The inclusion of dynamic conditional correlations in the GARCH model can therefore better capture the frequent fluctuations in futures markets.

Notes

[1] Bautista (2003) uses the DCC of Engle to obtain the dynamic correlation between the interest rate and the exchange rate in the Philippines in order to observe its structural changes. Recognizing the dynamic conditional correlation, we instead use this approach, incorporated with ECM, to obtain the variance matrix so as to analyse the hedging effectiveness of foreign currency futures, which is then compared with OLS and other multivariate GARCH hedges.

[2] The hedge ratio is calculated as the ratio of the covariance between spot and futures prices to the variance of the futures price.

[3] For discussions of other hedging strategies, readers can refer to Chen et al. (2003).

[4] Bollerslev (1990) decomposes the covariances into SDs and correlations and assumes CCCs between financial variables. Engle and Kroner (1995) instead propose the BEKK (named after Baba, Engle, Kraft and Kroner) multivariate GARCH model to ensure time-varying second moments and a positive-definite conditional-variance matrix. Its disadvantage is that the parameters cannot be easily interpreted.

[5] Kroner and Sultan (1993), who were the first to introduce an ECM for the first moment into a multivariate GARCH, studied the hedging effectiveness in five foreign exchange futures markets, which again are examined by Lien and Luo (1994).

[6] The minimum risk hedge ratio minimizes the variance of the hedge portfolio, + + according to Johnson (1960), where and are the variance of the spot and futures prices, respectively; and X_s and X_f are the spot and futures positions, respectively. By the first-order condition, the optimal hedge ratio can be obtained , where and the negative sign represents shorting a futures contract.

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