Applied Economics ›
Volume 39, 2007 - Issue 10

Original Articles

A bivariate Markov regime switching GARCH approach to estimate time varying minimum variance hedge ratios

Hsiang-Tai Lee & Jonathan K. Yoder

Pages 1253-1265 | Published online: 04 Apr 2011

Cite this article https://doi.org/10.1080/00036840500438970

Abstract

This article develops a new bivariate Markov regime switching BEKK-Generalized Autoregressive Conditional Heteroscedasticity (GARCH) (RS-BEKK-GARCH) model. The model is a state-dependent bivariate BEKK-GARCH model and an extension of Gray's univariate generalized regime-switching (GRS) model to the bivariate case. To solve the path-dependency problem inherent in the bivariate regime switching BEKK-GARCH model, we propose a recombining method for the covariance term in the conditional variance-covariance matrix. The model is applied to estimate time-varying minimum variance hedge ratios for corn and nickel spot and futures prices. Out-of-sample point estimates of hedging portfolio variance show that compared to the state-independent BEKK-GARCH model, the RS-BEKK-GARCH model improves out-of-sample hedging effectiveness for both corn and nickel data. We perform White's (2000) data-snooping reality check to test for predictive superiority of RS-BEKK-GARCH over the benchmark

model and find that the difference in variance reduction between BEKK-GARCH and RS-BEKK-GARCH is not statistically significant for either data set at conventional confidence levels.

Notes

[1]Alizadeh and Nomikos (2004) also propose a Markov regime switching approach (Hamilton, 1989) for hedging stock indices. Instead of estimating the hedge ratio by estimating the conditional second moments as all GARCH methods do (including RS-BEKK-GARCH), they treat the hedge ratio as a time-varying regression coefficient, which conditions on the state of market volatility with transition probabilities a function of lagged time-varying basis and estimate the coefficient directly. The rationale behind their model is that the dynamic relationship between spot and futures returns, and hence the hedge ratio, can be characterized by regime shifts (Sarno and Valente, 2000). Other articles that apply regime-switching models to financial data include Schaller and Van Norden (1997), Katsimi (2000), Caporale and Spagnolo (2004), Kuo and Lu (2005) and Kasuya (2005), among others.

[2] For ease of comparison and reference, we follow the notation of White (2000) as closely as possible in this section. The values referred to be the symbols f and R in this section are unrelated to those in previous sections of this article.

[3] To apply the stationary bootstrap method of Politis and Romano (1994), we set the smoothing parameter q to 0.5 and we resample 1000 times for each application. Testing for statistical significance of point estimates of hedging performance differences is relatively uncommon. Bystrom (2003) tests the statistical significance of the hedged portfolio variance by using conventional bootstrap method and finds that no hedge method differs in a statistical way from the unhedged spot position and no hedge method significantly differs from any other hedge method. By performing White's reality check, however, we can test the statistical significance of the hedging performance by incorporating the potential effect of data snooping bias.