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Forecasting the weekly time-varying beta of UK firms: GARCH models *vs*. Kalman filter method

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Abstract

This paper investigates the forecasting ability of three different Generalised Autoregressive Conditional Heteroscedasticity (GARCH) models and the Kalman filter method. The three GARCH models applied are: bivariate GARCH, BEKK GARCH, and GARCH-GJR. Forecast errors based on 20 UK company's weekly stock return (based on time-varying beta) forecasts are employed to evaluate the out-of-sample forecasting ability of both the GARCH models and the Kalman method. Measures of forecast errors overwhelmingly support the Kalman filter approach. Among the GARCH models, GJR appears to provide somewhat more accurate forecasts than the two other GARCH models.

Keywords:

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Notes

Brooks, Faff, and McKenzie (1998) provide several citations of papers that apply these different methods to estimate the time-varying beta.

The leverage effect is due to the reduction in the equity value, which would raise the debt-to-equity ratio, hence raising the riskiness of the firm as a result of an increase in future volatility. Glosten, Jagannathan, and Runkle (1993) provide an alternative explanation for the negative effect; if most of the fluctuations in stock prices are caused by fluctuations in expected future cash flows, and the riskiness of future cash flows does not change proportionally when investors revise their expectations, the unanticipated changes in stock prices and returns will be negatively related to unanticipated changes in future volatility.

There is more than one GARCH model available that is able to capture the asymmetric effect in volatility, however, according to Engle and Ng (1993), the Glosten, Jagannathan, and Runkle (1993) model is the best at parsimoniously capturing this asymmetric effect.

Since only 20 firms are looked at, results presented cannot be generalised but only have implication for the firms studied.

The augmented Dickey–Fuller test is applied to check for the stochastic structure of the beta series. All GARCH estimated beta series are found to have zero unit roots. Some of the beta estimated by means of the Kalman filter approach may contain one unit root. As pointed out by one of the referees this result is not surprising since this is almost true by the style of construction of the Kalman filter and the GARCH. These results are also available on request.
