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Volume 28, 2009 - [Issue 5](#)

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Structure and Asymptotic Theory for Multivariate Asymmetric Conditional Volatility

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Pages 422-440 | Published online: 26 Feb 2009

 Cite this article  <https://doi.org/10.1080/07474930802467217>

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Abstract

Various univariate and multivariate models of volatility have been used to evaluate market risk, asymmetric shocks, thresholds, leverage effects, and Value-at-Risk in economics and finance. This article is concerned with market risk, and develops a constant conditional correlation vector ARMA–asymmetric GARCH (VARMA–AGARCH) model, as an extension of the widely used univariate asymmetric (or threshold) GJR model of Glosten et al. ([1992](#)), and establishes its underlying structure, including the unique, strictly stationary, and ergodic solution of the model, its causal expansion, and convenient sufficient conditions for the existence of moments. Alternative empirically verifiable sufficient conditions for the consistency and asymptotic normality of the quasi-maximum likelihood estimator are established under non-normality of the standardized shocks.

Keywords:

Asymmetric effects

Asymptotic theory

Conditional volatility

Multivariate structure

Regularity conditions

JEL Classification:

C32

C51

C52

Acknowledgments

This is a substantially revised and shortened version of Hoti et al. ([2002](#)). The authors wish to thank two referees for very helpful comments and suggestions, Manabu Asai, Massimiliano Caporin, Robert Engle, Thierry Jeantheau, Offer Lieberman, Shiqing Ling, Essie Maasoumi, Marcelo Medeiros, Peter Phillips, and seminar participants at the Bank of Italy, Chiang Mai University, Chinese University of Hong Kong (Finance), Curtin University of Technology, Graduate Institute of International Studies, Geneva, Hong Kong University of Science and Technology (Mathematics, and Information and Systems Management), Kyoto University, Tokyo Institute of Technology, University of Canterbury, University of Florence, University of Hong Kong (Statistics and Actuarial Science), University of Milan, University of Otago, University of Rome “La Sapienza,” University of Tokyo, University of Western Australia, and Yokohama National University for insightful discussions, and the Australian Research Council for financial support.

Notes

Notes: 1. The dynamic conditional correlation (DCC) model of Engle (2002) and the varying conditional correlation (VCC) model of Tse and Tsui (2002) always have the same number of parameters, while the CCC and VARMA-GARCH models have the same number of parameters only in some special cases, such as in Table 1. 2. Although the VARMA-GARCH and VARMA-AGARCH models are specified as having interdependence between h_{it} and h_{jt} for $i, j = 1, \dots, m$; $k = 1, \dots, r$; and $l = 1, \dots, s$; for purposes of Table 1, h_{it} is specified to depend only on h_{jt} .

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