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Comment on Article by Windle and Carvalho

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1 Introduction

I congratulate the authors on their state-space model for covariance matrices associated with multivariate return vectors subject to stochastic volatility. Despite the apparent restrictions imposed on the proposed model, its tractability offers exciting possibilities for modelling and forecasting the covariance of high dimensional multivariate financial asset price returns.

2 The proposed model requires strong assumptions

Conditionally normal price returns. To obtain the computational advantages delivered by the proposed model, one is required to make strong distributional assumptions regarding both the measurement and transition equations in the state-space model. As the authors detail in Section 5, the measurement equation imposed is equivalent to assuming that the m-vector of prices evolves over day t according to a geometric Brownian motion process. This relates to a conditional Gaussian distribution for the daily (log) price return. Yet, when modelling price returns in a univariate setting, the conditional distribution of the return is often taken to have 'fatter tails' than a normal distribution (see, for example, Chib et al. (2002)). That is, even when accounting for changes in the latent volatility process, the conditional normal distribution is not usually sufficient to generate the marginal skewness and leptokurtosis evident in observed daily returns.

A diffusive volatility process. In addition, the latent covariances in the proposed multivariate model (and indeed in the discussed competing multivariate models) are implicitly assumed to be 'locally smooth', and thereby will change only slowly over time in a manner akin to a random walk (see Prado and West (2010), p. 272). Arguably, this assumption would be similar to assuming that the stochastic variances evolve from day to day according to a (potentially nonlinear, multivariate) diffusive process. However, again in the univariate setting, diffusive volatility alone is generally viewed as a restrictive assumption, with jumps in the price process (and indeed, in the latent stochastic variance process) deemed important for the prediction of derivative asset prices (e.g. Bates (2000), Duffie et al. (2000), Eraker et al. (2003) and Maneesoonthorn et al. (2012)).

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