

**Referee Report on Manuscript 529**  
**Contagion effect of financial crises on OECD stock markets**

The paper investigates the interesting question, whether the financial crises caused significant changes in the inter stock market correlation structure modeled via a DCC-GARCH model as proposed by Engle (2002). The authors claim to provide evidence for a substantial increase in the mean of the conditional correlation coefficients between U.S. and OECD stock markets.

**General comments**

1. The presentation of the applied statistical methodology lacks stringency. Furthermore, I fear that this lack of stringency backfires on the statistical evidence presented in favor of a structural break within the mean of conditional correlation coefficients of the applied DCC-GARCH models. The authors apply a two step procedure. The first step identifies a break in U.S. stock returns (NASDAQ 100, from 02/01/2002 to 01/06/2009) via the methodology derived in Bai and Perron (1998, 2003) for testing structural breaks in the mean parameters of linear regression models. As the authors later on use generalized GARCH models to assess the properties of stock return series, the use of linear is questionable. The estimated break point is then used to check for significant differences in the correlation structure. The detected break point may hence reflect GARCH effects within the U.S. stock returns. Thus, as the correlation structure is inspected under incorporation of the time series used for detection of the structural break, the test statistic used for testing differences in correlation parameters is not ensured to be asymptotically normally distributed. This suggests that the reported differences are not necessarily statistically different from zero.
2. In contrast to the approach suggested by the authors, the evidence for contagion effects captured by changes in mean correlation should be assessed by a one step approach. Using the methodology developed by Andrews (1993, 2003) and Andrews and Ploberger (1994), the whole sequence of  $F$  statistics gauging the difference in mean conditional correlation should be inspected. These three articles provide the asymptotic properties of the supremum of a sequence test statistics for assessing structural breaks in several parameters. Furthermore, the use of the mean of the conditional correlation coefficients for assessing structural stability is questionable. Should the mean of the conditional coefficient not correspond to the unconditional correlation as a function of the true structural parameters of the DCC-GARCH mode, e.g.  $\bar{Q}$ ? Then the whole analysis should be based on direct assessment of the structural stability of unconditional correlations, not approximating these by means of conditional correlations.

**Specific comments**

1. Given the quite extended summary of applied methodology used to pin down the structural break, including the seemingly unrelated null hypothesis of parameter stability of mean coefficients within the linear regression setup, the authors lack to provide test results concerning the significance of the detected break. Furthermore, what is the distribution of the break point, which is as well provided by the cited papers Bai and Perron (1998, 2003).

2. The exact model specification, i.e. exact description of variables  $y_t$  and  $x_t$ , of the applied linear model in step 1 is not presented within the paper. However, this specification is essential for gauging the evidence presented for a break suggested to occur at 01/10/2007.
3. Clarify the notational use of  $R_t$  and  $R_{i,t}$  for returns and correlation structure respectively.
4. Clarify the use of  $\bar{Q}_t$  in Equation 8., should this be not only  $\bar{Q}$ ? Furthermore, since  $\bar{Q}$  provides the unconditional covariance matrix, it would be of interest, whether this true structural parameter of the model is also subject to structural shift.
5. Typo in line two of conclusion: OECD

## References

- [1] Andrews, D.K., (1993), Tests for Parameter Instability and Structural Change with Unknown Change Point. *Econometrica*, vol.61, no.4, pp. 821-856.
- [2] Andrews, D.K., (2003), Tests for Parameter Instability and Structural Change with Unknown Change Point: A Corrigendum. *Econometrica*, vol.71, no.1, pp. 395-397.
- [3] Andrews, D.K., and Ploberger, W. (1994), Optimal Tests when a Nuisance Parameter is present only under the Alternative. *Econometrica*, vol.62, no.6, pp. 1383-1414.