

Opponent's Report on Dissertation Thesis

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Advisor:	Mgr. Lukáš Vácha, Ph.D.
Title of the Thesis:	Long-range cross-correlations: Tests, estimators and applications
Type of Defense:	DEFENSE
Date of Pre-Defense:	May 15, 2013
Reviewer:	Enrico Onali, Ph.D.

Address the following questions in your review, please:

- a) Can you recognize an original contribution of the author?
 - b) Is the thesis based on relevant references?
 - c) Is the thesis defensible at your home institution?
 - d) Do the results of the thesis allow their publication in a respected economic journal?
 - e) Are there any additional major comments on what should be improved?
 - f) Were your comments raised at the pre-defense, addressed in the dissertation submitted to the regular defense? (The pre-defense report is enclosed below)
 - g) What is your overall assessment of the thesis? I recommend the thesis to be defended without major changes; (b) The thesis is not defensible.
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(Note: The review should be at least 2 pages long.)

Content of the Review:

Dr Enrico Onali, Senior Lecturer at Bangor Business School, UK.

This PhD thesis centres on the description, development, and assessment of tests and estimators of long-range cross-correlations. The approach is mainly theoretical, but an empirical analysis of the so-called leverage effect from the perspective of long-range cross-correlations is also presented.

The candidate has demonstrated a strong understanding of the literature on long-range dependence and cross-correlations, both empirical and theoretical. Its knowledge of the econophysics literature (in particular the literature on long memory and multifractality), and the applicability of these estimators on financial time series data is demonstrated also by a strong publication record in physics journals.

The thesis is very ambitious in the type of research question addressed, and the candidate has proven strong mathematical skills and a very good understanding of the estimators examined. The thesis is well-structured and interesting, and has benefitted from the first-round of comments for the pre-defense.

The thesis consists of seven chapters. The first chapter serves as an introduction to the topic of long-range dependence and long-range cross-correlation. The thesis fills an existing gap in the literature by providing a general framework for treating such type of processes. Chapter two defines long-range dependence and long-range cross-correlation, and the difference between short-range dependence/cross-correlation and long-range dependence/cross-correlation. Chapter three provides an investigation of several important long-range dependent/cross-correlated processes, and introduces the Mixed-Correlated ARFIMA process. Chapter four discusses tests for long-range cross-correlations, three of which are developed by the author, with specific regard to their finite-sample properties. Chapter five focuses specifically on estimators of the bivariate Hurst exponent, some of which have been introduced by the candidate. Chapter six provides an empirical application of the tests and estimators introduced in the previous chapters by investigation of a phenomenon commonly known as leverage effect. Chapter seven concludes the thesis and provides some directions for future research on the topic.

The candidate's contributions are as follows:

1. A rather general theoretical framework for short-range and long-range temporal dependence, and short-range and long-range cross-correlation.
2. The introduction of tests and estimators of long-range cross-correlations, as well as an investigation of their finite-sample properties using Monte Carlo simulations.
3. An empirical application of the concept of long-range cross correlation to a widely-known stylized fact of capital markets (the leverage effect).

The thesis is, overall, well-written (although the exposition could be tightened up further), and the literature review is comprehensive. In my pre-defense report, I argued


that the thesis will benefit from a stronger reliance on sources related to financial economics and econometrics.

As required in my pre-defense report, the author has provided some discussion on the relation between fractional cointegration and mixed-correlated ARFIMA processes. A short discussion on the importance of structural breaks and distributional properties of returns in estimating long-range dependence has been added to the conclusions. Other suggested references have been added in the text.

In my pre-defense report, I also noted that the candidate should tighten up exposition in a number of instances. The candidate has addressed most of these issues, and the dissertation has improved as a result.

I think a closer connection with mainstream finance/economics theory would help the candidate publish in good mainstream finance/economics journals. To this end, the thesis could have benefitted from a more extensive empirical analysis, such as that of chapter 6 on the leverage effect. Interesting applications could also be in the field of financial risk-management. For instance, it would be interesting to examine the effect of financial crises on long-range cross-correlations across stock market indices, and even individual stocks.

To conclude, I believe this thesis would be defensible at my home institution, and I recommend the thesis to be defended without major changes.

Date:	24/09/2013
Reviewer's Signature:	
Reviewer's Affiliation:	Enrico Onali, Ph.D. Bangor University, UK