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Editorial

Unit Roots and Structural Breaks

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This special issue deals with problems related to unit roots and structural change, and the interplay between the two. The research agenda dealing with these topics have proven to be of importance for devising procedures that are reliable for inference and forecasting. Several important contributions have been made. Still, there is scope for improvements and analyses of the properties of existing procedures. This special issue provides contributions that follow up on what has been done and/or offer new perspectives on such issues and related ones. Both theoretical and applied papers are included. I briefly outline the papers, grouping them by themes.

Structural Change—Theory. Cheol-Keun Cho and Timothy J. Vogelsang consider testing for structural change when serial correlation may be present in the errors of the regression, in which case a common practice is to use a heteroscedasticity and autocorrelation robust Wald test. Following important work by Vogelsang and co-authors (e.g., Kiefer and Vogelsang (2015)), a fixed-bandwidth theory is developed to provide better approximations for the test statistics. It is shown to improve upon the standard asymptotic distribution theory, whereby the bandwidth is negligible compared to the sample size; e.g., Andrews (1993), Bai and Perron (1998, 2003). **Jingjing Yang** considers the consistency of trend break point estimators when the number of breaks is underspecified. As shown in Bai (1997) and Bai and Perron (1998), with stationary variables, if a one-break model is estimated when multiple breaks exist, then the estimate of the break fraction converges to one of the true break fractions (the one that minimizes the overall sum of squared residuals). Interestingly, she shows this to not be the case when considering breaks in a linear trend function. This result suggests that the application of the Kejriwal and Perron (2010) extension of the Perron and Yabu (2009) test should be applied with caution. **Aparna Sengupta** considers the problem of testing for a structural break in the spatial lag parameter in a panel model (spatial autoregressive). She proposes a likelihood ratio test and derives its limit distribution when both the number of individual units N and the number of time periods T is large or N is fixed and T is large. A break date estimator is also proposed.

Unit Root and Trend Break—Theory. **Ricardo Quineche and Gabriel Rodríguez** provide interesting further finite sample simulation results about the tests proposed by Perron and Rodriguez (2003), who extended the work of Perron (1989, 1997), Zivot and Andrews (1992), and Vogelsang and Perron (1998), among others. They show that the M^{GLS} versions suggested by Ng and Perron (2001) suffer from severe size distortions when using the so-called "infimum method" to select the break date (i.e., minimizing the t-statistic of the sum of the autoregressive coefficients) and common methods to select the autoregressive lag order. This occurs whether a break is present or not. On the other hand, when using the "supremum method" (i.e., minimizing the sum of squared residuals from the trend-break regression), this problem only holds when no break is present. These results point to the usefulness of the methods advocated by Kim and Perron (2009) and Carrión-i-Silvestre et al. (2009).

Fractional integration—Theory. **Seong Yeon Chang and Pierre Perron** consider testing procedures for the null hypothesis of a unit root process against the alternative of a fractional process, called a fractional unit root test. They extend the Lagrange Multiplier (LM) tests of Robinson (1994) and Tanaka (1999) to allow for a slope change in trend with or without a concurrent level shift under both the null and alternative hypotheses. Building on the work of Chang and Perron

(2016) and Perron and Zhu (2005), they show that the limit distribution of the proposed LM tests is standard normal when using the Kim and Perron (2009) method to estimate the break date. However, unlike in that paper, there is no need to perform a pre-test for a change in slope. **Man Wang and Ngai Hang Chan** consider testing for the equality of integration orders amongst a set of variables. This is useful as a prior step to test for fractional cointegration. They extend the work of Hualde (2013) and propose a one-step residual-based test that overcomes computational issues. The test statistic has an asymptotic standard normal distribution under the null hypothesis.

Structural Change—Empirical Studies. **María Dolores Gadea, Ana Gómez-Loscos and Antonio Montañés** investigate changes in the relationship between oil prices and the US economy from a long-term perspective. First, they show that neither series have structural breaks in mean, though they have different volatility periods. Using a VAR method, a rolling estimation of causality and long-term impacts, and the Qu and Perron (2007) methodology, they find no significant effect between changes in oil prices and GDP growth when considering the full period. However, a significant relationship is present in some subperiods. Using a time-varying VAR model, they show the that the impact of oil price shocks on GDP growth has declined over time and that the negative effect on GDP growth is greater when large oil price increases occur. **Jesús Clemente, María Dolores Gadea, Antonio Montañés, and Marcelo Reyes** reconsider the common unit root/co-integration approach to test for the Fisher effect for the G7 countries. Using Pesaran's (2007) panel unit root test, they argue that nominal interest and inflation rates are better represented as stationary variables. Then, using the Bai–Perron procedure (1998, 2003), they show the existence of structural changes in the Fisher equation. Once the breaks are accounted for, they find very limited evidence for the Fisher effect.

I think these papers offer an interesting and useful array of contributions under the broad topic of unit roots and structural breaks. Thanks are due to the Editor Marc Paolella, the assitant editors Michele Cardani and Lu Liao, as well as the numerous referees who provided useful comments and advice.

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