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Canadian Economics Association Special Prize for Outstanding Research 1994

Research Contributions of Jean-Marie Dufour, 1989-1994

During the last 5 years, Jean-Marie Dufour has published 25 articles on a wide spectrum of econometric and statistical topics, most of them in major international journals, including *Econometrica* (3 articles), *JASA* (2), the *Journal of Econometrics* (4), the *International Economic Review* (1), *Econometric Theory* (3), *the Review of Economics and Statistics* (1), the *Journal of Statistical Planning and Inference* (2), etc. Being both a mathematical statistician and an economist by training, Dufour has done econometric research that is remarkably well grounded in statistical theory. An especially original aspect of his work is the emphasis on finite-sample properties and techniques in econometrics (as opposed to techniques based on asymptotic approximations) and the development of finite-sample methods to deal with problems for which only large-sample methods are typically available.

His published work during the last 5 years covers 4 broad themes.

(1) The first one deals with the **invariance properties of statistical tests**. In this work, it is shown that the vast majority of test procedures used for nonlinear models produce results which are not invariant to apparently innocuous transformations (such as measurement unit changes). Furthermore, theoretical characterizations of invariance are obtained and some new invariant tests are proposed [*Econometrica* (1991, with Marcel Dagenais)].

(2) The second one aims at developing **finite-sample inference procedures in parametric models**. In this research stream, it is emphasized that the central difficulty for developing valid (finite-sample) tests and confidence sets in econometrics is the nuisance parameter problem, i.e., the dependence of test statistics on unknown parameters, which can be dealt with either by finding nuisance-parameter-free bounds or

by finding appropriate pivotal functions. Using such techniques, and in particular the concept of generalized bounds test, exact inference procedures are proposed for various problems met in econometrics, such as:

a) nonlinear hypotheses, inequality restrictions and non-nested hypotheses (*Econometrica*, 1989);
b) dynamic models both stationary and non-stationary (*Econometrica*, 1990; *Journal of Econometrics*, 1991, with Maxwell King);
c) models with heteroskedasticity; and
d) structural change tests.

(3) The third theme concerns the development of **nonparametric methods applicable in time series and econometrics**. Here it is emphasized that inference in nonparametric models should be based on appropriate pivotal and invariant statistics, such as sign and rank statistics. Since such techniques are typically available only for relatively simple static models and have been little exploited in econometrics, this work extends these types of procedures to nonparametric contexts and proposes various finite-sample nonparametric tests for serial dependence, rational expectations, etc., which are applicable under general conditions of non-normality and heteroskedasticity [several articles with Marc Hallin and Bryan Campbell].

(4) The fourth theme deals with the development of **causality tests in the context of multivariate ARMA models**. Since such models can be considerably more parsimonious than the more familiar VAR models, they provide an attractive alternative to VAR models for representing multivariate economic time series. However, causality properties (in the sense of Granger) are relatively difficult to study and test in the context of vector ARMA models, because they involve multilinear forms and non-standard distributions. This work studies how to characterize and test causality hypothesis in such models (*JASA*, 1992; *Journal of Econometrics*, 1994).

Jean-Marie Dufour also edited recently a book on "New Developments in Time Series Econometrics" published by Springer-Verlag, and a special issue of the *Journal of Econometrics*, on "Recent Developments in the Econometrics of Structural Change". He is a past associate editor of the *Canadian Journal of Economics* and *Econometric Theory*, and he is currently an Associate Editor of several other journals (including the *Journal of Econometrics*, the *Annales d'Économie et de Statistique*, and *Econometric Reviews*).

Dufour is well known both among economists and statisticians in Canada, and he has been a member of both the SSHRC Economics Committee and the NSERC Statistics Committee. He is an elected member of the International Statistical Institute and was a member of the Program Committee of the last World Congress of the Econometric Society (Barcelona). At the next European Meetings of the Econometric Society to be held in Maastricht at the end of this summer, he will give a special invited lecture on "Impossibility Theorems in Econometrics".