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Canonical correlation and canonical variables in econometrics

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SUMMARY

This book is concerned with the application of the canonical correlation technique aiming at the clarification and solution of economic and econometric problems. Canonical correlation is the maximized correlation between a linear combination of a set of variables and a linear combination of another similar set, e.g., between the endogenous and the predetermined variables in an econometric model.

The problems attacked with the help of canonical correlation, as described in the literature on the subject, are nearly all related to matters of estimation of coefficients in economic relations and models, to measuring the strictness of such relations and to the construction of new "summarizing" economic variables.

Little attention has so far been dedicated to the role of the canonical correlation technique as a means to test the proposed specification of an economic relation (equation) and of a whole economic model. Economic theory in many cases is not sufficiently "certain" - in the sense of being generally accepted and irrefutable -, so that the economic investigator has to solve the problem of which variables are to be included and which to be excluded from each separate relation he wishes to study, before he can start measuring the relation, i.e., before estimating its coefficients.

After an introduction in Chapter 1, a general outline of the technique of canonical correlation in Chapter 2 and a survey of the econometric literature on the subject in Chapter 3, Chapter 4 occupies itself with the theory concerning the interrelations between canonical correlation and the construction of econometric models. Both specification and estimation problems are discussed, with emphasis on the former. A programme is developed consisting of a series of tests on the acceptability of variables, both in the model as a whole and in each separate equation. A synopsis of this proposed "canonical method" is detailed in 4.7. See also the conclusions of our investigation in 1.4.

Chapter 5 presents two applications of this research programme. One application is made to the well-known Klein model for the United States, "explaining" aggregate consumption, net investment and the private wage

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bill. It is shown that the proposed specification of this model {formulas (5.1) - (5.6)} is not optimal, among other things, because a number of its variables do not (additionally) contribute significantly to "explaining" the endogenous variables. After the number of endogenous variables has been reduced from 6 to 4 and the number of predetermined variables from 7 to 4, an alternative and acceptable specification is obtained {formulas (5.21), (5.24), (5.25) and (5.4)}.

The second application concerns the question, how many independent relations may be assumed to exist in the "Grecon model 80-CA" of the Dutch economy, constructed at the Econometric Institute of the Groningen University. This model, as published, contains 8 behavioural equations "explaining" 8 endogenous variables with the help of 18 predetermined variables. The analysis shows that not more than 6 independent relations containing 6 endogenous variables and (at most) 17 predetermined variables can be distinguished, so that the model in its original form is not the best conceivable. It is further demonstrated that after slightly changing the set of endogenous variables the number of "significant relations" and of endogenous variables can be increased to 7; the number of predetermined variables then amounts to (at most) 15.

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