AN APPLICATION OF EM ALGORITHM TO THE ANALYSIS OF STRUCTURAL CHANGE THROUGH INPUT-OUTPUT

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ABSTRACT
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The starting point of this paper is the fact that the transpose of the coefficient matrix of a closed Leontief model is formally equivalent to the matrix of one-step transition probabilities of an ergodic Markov chain. This formal identity can be usefully exploited to analyse structural changes in a given economic system, through Input-Output. The dynamic model, which can be built along the lines suggested by (among others) Diebold, Lee and Weinbach (1992), Hamilton (1993a) and (1993b), makes it possible to identify the contribution of two main classes of factors determining structural change:

a) short period endogenous factors, linked to actual output dynamics like scale economies, research and development and human capital investment;
b) exogenous long period factors, like the introduction of process innovations.

In this approach, forecasts of short period changes in the closed Leontief model coefficients are formally equivalent to the conditional forecasts of transition probabilities; forecasts of long period, structural coefficient changes are formally equivalent to the estimates of ergodic probabilities; finally, the dynamics of gross outputs and of aggregate value added can be explained as a mixture of stochastic processes with weights depending on the structural dynamics of the economic system and coefficient changes can be forecasted using EM algorithm. The model performs well in explaining the dynamic behaviour of the Italian quarterly value added in the years 1970-2003, as a result of changes in the structure of the I-O tables available during the same time interval, aggregated at a three sectors level.

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