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IDENTIFICATION CONDITIONS IN SIMULTANEOUS SYSTEMS OF COINTEGRATING EQUATIONS WITH INTEGRATED VARIABLES OF HIGHER ORDER [1]

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This paper discusses identification of systems of simultaneous cointegrating equations with integrated variables of order two or higher, under constraints on the cointegration parameters. Rank and order conditions for identification are provided for general linear constraints, covering both cross-equation and equation-by-equation restrictions.

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Keywords: Identification, (Multi-)Cointegration, I(d), Stocks and flows, Inventory models.

1. Introduction

The identification problem of system of simultaneous equations (SSE) lies at the heart of classical econometrics, see e.g. Koopmans (1949). Rank (and order) conditions for identification of these systems are well summarized in Fisher (1966) or Sargan (1988).

Simultaneous systems of cointegrating (CI) equations have revived interest on SSE over the last three decades, especially for variables integrated of order 1, I(1), see Engle and Granger (1987). When identifying restrictions are placed only on the CI parameters, the rank and order conditions for identification for I(1) simultaneous systems of CI equations, here indicated as I(1) SSE, coincide with the classical ones for SSE, see e.g. Saikkonen (1993), Davidson (1994) and Johansen (1995). The present paper discusses identification for SSE with integrated variables of order higher than 1, when restrictions are only placed on the CI parameters, and shows that the rank and order conditions have relevant differences in this higher order case.

CI SSE with variables integrated of order 2, or I(2) SSE, have been used to accommodate models of stock and flow variables, of inventories, and of consumption, income and wealth see Klein (1950), Hendry and von Ungern-Sternberg (1981) and Granger and Lee (1989). A different rationale for I(2) SSE is provided by the literature on integral control mechanisms in economics initiated by Phillips (1954, 1956, 1957) in relation to the Error Correction Mechanism, EC, see Haldrup and Salmon (1998).

In I(2) systems, CI equations may involve both stocks and flows; these equations are called 'integral control' in the EC literature, or 'multi-cointegrating' relations (multi-CI), see Granger and Lee (1989). They are also a special case of 'polynomial-cointegration' relations, as introduced by Engle and Yoo (1991). A different

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