

Referee report on Niels Framroze Møller: "Bridging Economic Theory Models and the Cointegrated Vector Autoregressive Model"

1 General comments

This paper is well written and explains pedagogically how, for the most part, static theory models with exogenous variables can be represented in a cointegrated VAR, to give clear economic interpretation to the parameters of such econometric models. Concentrating on static economic theory makes the paper focused, but the inevitable limitations should also be reflected upon in a paper like this. Since long passages of the paper is on the standard model of economic dynamics (difference equations and global with asymptotic stability) I think that it can be shortened, in section 4.2 and 4.3 in particular, see the detailed comments.

2 Detailed comments

p. 2: § 3, line 5. "as being $I(1)$ ", and drop italics for approximated.

p.2 §5, line 6. Replace "useful inference" with the more precise "reliable inference".

p. 2, §5, last sentence. This is natural for static theories, which is indeed the type of theory that is addressed throughout the paper. Hence why not write "static theory model" instead of the more obscure "type of theory models"? In the introduction, it would be of interest to comment on the type of theory where the order of integration and/or the nature of the growth (local or deterministic trends) are a important concepts. I can think of for example consumption theory (consumption expenditure follows a random walk, hence testing of the hypothesis of a constant savings rate requires a statistical model with a unit-root, and the equilibrium correction occurs in the "income equation"); theories of economic growth (without technical progress in the form of a trend, growth in GDP per capita cannot be explained); and a large part of current standard macroeconomic systems which operates with variables that are deviations from their respective steady-states (possibly with deterministic growth in them), so these systems allow roots outside and inside the unit circle, but not unit roots.

p. 3 §2 of section 2, line 2. Change "may be regarded" to "may often be regarded".

p. 4 last line. A is diagonal as in a reduced form VAR, or a matrix with 1's on the diagonal, as implied by a simultaneous equations model? "Normalization" covers both interpretations. But the assumption that Σ is diagonal sits best with the

second interpretation, unless simultaneity is ruled out from the outset, and a clear causal structure is imposed.

p. 5 §1. As I see it, the statistical model within which economic theories are estimated and hypothesis are tested must itself be adequate and relevant. Of course, the statistical model of stationary variables is very flexible: it allows roots “everywhere” except on the unit circle. Hence, I agree that an argument is needed to leave the $I(0)$ model and use the more restrictive $I(1)$ model instead. For some theories, unit-roots are implied or assumed, so internal consistency requires the use of the $I(1)$ model and non-standard asymptotic inference. In other cases, the ones of primary interest here, the use of $I(1)$ model is more like a concession to the (estimated) properties of the time series, to avoid the pit-fall of spurious regressions. The reason, it appears, is that the nominal size of the tests gets completely misleading, not only when a root is exactly equal to one, but also when it is close to one. This, is a good motivation. It would be of interest to give the reader some concrete ideas (numbers) about when standard inference gets really misleading, e.g., root equal to 0.95 or 0.995, or 0.9995?.

p. 6 first full sentence. OK as a pragmatic view, but clearly it is of interest for the validity and interpretation of the theory if stationarity is assumed but the data is blatantly non-stationary. To say that a “structural equation”, which assumes an $I(0)$ “world” is unaffected by finding that $I(1)$ -ness strikes me as a little naive. It may also lead to some not very helpful “conclusions” like $I(1)$ -ness in inflation and in rate of unemployment etc. Of course, these variables are non-stationary, but the $I(1)$ model is probably not the right representation of the non-stationarity which is more likely to be due to regime shifts, which can often be modelled by dummies and exogenous (in the sense of this paper) $I(0)$ variables with breaks in them.

p. 6 §2. This point is very well taken. Note however that the class of models that you choose to consider rules out other popular modern theories, where it can happen that non-stationarity is implied by restrictions on the equations. An example of some interest is the so called hybrid new Keynesian Phillips curve with exogenous $I(0)$ forcing variable. If dynamic homogeneity is added, as one often finds in the literature, $I(1)$ -ness of the rate of inflation is implied even though inflation is assumed to be $I(0)$ in the outset. Hence persistence in the “system variables” does not always originate in the exogenous variables, although it is certainly true for the conditionally full rank models considered here.

p. 9 eq (30). As the economics of this example model is that of perfect competition in a single market one expects the usual model, i.e., a price adjustment equation like (26) and $Q_t = \min\{Q_t^d, Q_t^s\}$, so (30) seems an unnecessary add-on to this model.

p. 11 §3. As noted above, it would be valued if the concept of “near unit root” was made more precise, if at all possible.

p. 12-14 (end of section 4.1). Since the model, at this stage of the argument, is within the stationarity framework, standard theory of global asymptotic stability applies, and with reference to that, the exposition can be made much shorter and efficient.

p. 14 Section 4.2, line 2-3. Change “in some sense arbitrary” to “subject to modelling”?

p. 18 eq (58). Despite the section heading, this theoretical equation is static.

p. 18 last paragraph. Since the theoretical model only contains expectations of exogenous variables, the discussion of different hypotheses of expectations formation becomes somewhat limited in scope. Most economist are accustomed to theories with expectations about endogenous variables, and then the consequences for the dynamics become more interesting (for example saddle-path stability as opposed to global asymptotic stability). It is possible to shorten section 4.3 considerably.