

## **In Search of a Causal Relationship Between Industrial Output and Employment in Ireland: A Comment**

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John Fell has produced a stimulating paper which uses VAR methodology to address the issue of causal relationships between employment and output at both aggregate and disaggregated levels. Given the techniques employed, it is difficult to comment on the results. My personal view is that a result such as output does not “Granger cause” employment is a characteristic of the data set and should not be used as a definitive guide to choosing between competing theories. Nevertheless, when such results can be shown to be robust to alternative data sets then they cannot be ignored in formal model building. Hence Fell’s conclusion that causality is absent in both aggregate and industry data must have implications for our thinking about these relationships and about policies designed to stimulate employment. Further, his finding that the relationship between real wages and output is stronger in modern industries has similar implications and provides a useful pointer to future research. This paper casts a disturbing light on, for example, Barry (1989).

Given these general remarks, my principal comments will deal with the techniques used in the paper. VAR methodology involves three basic steps – specification of the variables to be included in the VAR, determining an appropriate lag length and “innovation accounting” exercises which use residuals from the estimated system to address the questions of interest. The paper is strong on the first two but omits the third.

Given the limitations imposed by data availability it is difficult to criticise

the choice of endogenous variables. However, the use of a deterministic trend to capture exogenous influences is questionable given the work of Nelson and Plosser (1982) who, along with others, report results which suggest that trends are best represented by random walks. If this is the case then trends will be stochastic rather than deterministic. Note that the paper provides evidence that one of the endogenous variables, employment, is an integrated series which is non-stationary in its level and therefore has a stochastic trend. Apart from this reservation I have no quarrel with the specification of the VAR. Indeed the author is to be commended for his excellent treatment of lag specification which is more detailed and comprehensive than is usually the case in papers which use VAR methodology.

My major criticism of Fell's work concerns what he does not do rather than what he does. It is my view that step three is an integral and crucial element in VAR methodology. At this step the estimated VAR is inverted to give the moving average representation which expresses each endogenous variable as a function of its own innovations and the innovations of the other variables in the system, the innovations being that part of each endogenous variable which is not explained by the VAR.

A typical innovation accounting exercise would trace the response of employment to a unit innovation shock in output with the former reflecting the lagged responses of all endogenous variables in the system. It is only at this stage that the variables in the VAR are truly endogenous. Prior to inversion the VAR is a system of independent linear equations estimated by OLS. Hence, given the lag length, the F-tests reported for the employment and output equations would be the same regardless of whether the other equations are estimated or not. Stage three is therefore required to give a guide to the interactions and interdependences between the endogenous variables.

Innovation accounting is itself problematic. As Pagan (1987) points out, to make sense of the responses of one variable to a unit innovation in another variable requires that the innovations must be contemporaneously uncorrelated. For example, to make sense of employment responses to a shock in output it is necessary that the current values of hours and wages be undisturbed. However, as the system's innovations are unlikely to be contemporaneously uncorrelated VAR methodology requires the use of orthogonal innovations. That is, the variables must be ordered so as to assign contemporaneous correlation. With 4 endogenous variables there are 24 possible orderings so that the order selected is largely arbitrary. Further, if the impulse responses are sensitive to the ordering used then it is difficult to give a clear interpretation of the results. However it may be sensible to use the F-statistics reported in the paper, which are independent of any orthogonalisation, to arrive at a reasonable ordering at stage three.

## REFERENCES

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