

2. Problems of regional forecasting (Special article)

The construction and use of regional forecasting models is a comparatively recent phenomenon, and experience to date is mainly American. This article contains a brief review of the general structure of these models and problems involved in their construction and implementation. It also refers to specific problems in forecasting for Scotland and indicates the main lines of research which must be undertaken in the process of developing a model for the Scottish economy.

Structurally, the usual starting point for regional models has been to formulate them in almost identical terms to national models. The principal dependent variables are such aggregates as gross regional product, regional consumption, investment and public authorities' expenditure, regional employment and unemployment and regional exports and imports. Of course, given the typical character of a regional economy, there is considerable emphasis in the equations of the model on its "openness" and trade dependence, with the consequence that the region is viewed as a "satellite" of the national economy of which it is a part. A result of this is that many of the explanatory variables in the regional model are actual or predicted values of certain national economic variables. Formulated in this way the region is similar to a small, open national economy whose course is largely determined by the growth and pattern of demand in its major trading partners. In the regional case, however, there are additional constraints on the model since fiscal and monetary variables are mainly determined exogenously (though this is less true in the United States where state governments can exercise significant discretionary powers with respect to taxation and state expenditures).

For the regional forecaster this form of model specification poses two types of problem. The first is lack of data from which the parameters of the estimating equations may be fitted (and with which the predictions of the model may be compared). The second is the large number of exogenous explanatory variables which may have to be predicted in order to solve the regional model. However, before elaborating these problems and how they might be tackled it is worth commenting further on the type of model specification summarised above.

It is not obvious that trends in the main regional social accounts should constitute the most important set of variables for the forecaster to predict, or at least that these variables should be given the same emphasis as in national forecasting models. For instance, the Scottish balance of payments, while of academic (and perhaps political) interest, is not of much significance in regional forecasting, since unlike its national counterpart short-term trends in this balance have no special policy implications. And while trends in gross regional product (GRP), investment and employment are clearly of considerable interest, the behaviour of consumption, prices and the public sector deficit are, for varying reasons, of much less significance than in national forecasting models. Moreover, the emphasis to be given to particular macro-variables in regional forecasting will vary according to the characteristics of particular regions. All this implies that (to paraphrase from another context) while the traditional national accounts framework may be a good place to start in constructing regional forecasting models, it may not be a good place to end. To a greater extent than national models, regional models must be sui generis.

The data problems which are encountered in trying to construct a regional econometric model can be summarised under three headings, though it should be stressed that many of these problems are not peculiar to regional models. However, one problem which is peculiar to the regional case is that data are simply not available for many of the main national accounts aggregates, particularly on the expenditure side of the accounts. This alone means that the national accounting model described above cannot be implemented at regional level, since there are no time series data available from which parameters of the equations may be estimated. In most cases the data which are available have resulted in models which emphasise the composition and level of gross regional product from the output side (the contribution of each sector of production to gross product), and to a lesser degree from the income side (payments to resident factors of production).

A particular consequence of this approach is that direct estimates of export demand and expenditure on imports are avoided. On the other hand the openness of the typical regional economy demands that some explicit reference to the role of trade in the determination of regional outputs should be included in the model. For the most part, this is done by including

as explanatory variables such exogenously-determined variables as national GDP, relative price variables, world demand or market share variables for major commodities, etc. Exports and imports are thus implicitly included through their effects on domestic (regional) output levels. In some models, trade dependence is given further recognition by differentiating sectors which are heavily dependent on trade from those which are substantially dependent on purely regional demand. This corresponds to the distinction between "national" and "international" or "trading" sectors used in trade and development models, and which are usually associated with the use of input-output as the basic model framework. Hopefully this kind of disaggregation of output might be possible for Scotland soon, when the results of the Scottish Input-Output Project become available.

A second problem is that the time series of data for many regional variables are very short - for example the official series for Scottish GDP extends back only to 1960. Combined with the fact that time series data for many other variables do not exist at all, this inevitably constrains the number and specification of equations in the model. Due to these data problems, the majority of structural equations in most US regional forecasting models comprise simple bivariate relationships; other possible explanatory variables have to be excluded, either because the data are not available or because of insufficient degrees of freedom. This results in specification errors in the equations, in addition to other problems of which space precludes discussion.* These problems also occur in national forecasting models, but the latter have the advantage of longer time series for a more comprehensive set of variables, and the data are often of better quality. In relation to this last point, regional data series are often constructed from national series (rather than directly estimated) by assuming e.g. that regional and national productivities are identical. If the same national series are then used as explanatory variables, biases are introduced to the estimation procedures.

* A good summary of these problems is given in a recent article by N Glickman in the Journal of Regional Science. Vol.32, 1974.

Related to this question of data series is a third problem, which is that regional data are rarely available on a quarterly basis. Not only does this help account for the lack of observations referred to above, but it also creates serious problems for short-term forecasting, since the forecast variables are generally required for quarterly intervals, or at least half-yearly. For estimation purposes, the lack of quarterly data means that seasonal effects and short-term lag structures cannot be captured. These lacunae have obvious consequences for short-term prediction, in addition to which the accuracy of the forecasts cannot be tested.

The other major characteristic common to all regional econometric models is the extensive use of exogenously-determined explanatory variables in the equations of the model, for the most part national variables. The use of such variables as implicit determinants of regional trade has already been referred to. Combined with the usually rather simplified form of equations in the regional model (often of a highly recursive nature), this leads to a model which is very closely linked to the national model and hence highly dependent on actual or predicted movements in national variables.

This particular feature of regional models merits two comments. Logic and observation support the view that national trends exert a dominant effect on regional trends, and that on both theoretical and institutional grounds internally-generated regional effects are limited. Nevertheless a wholly "satellite" model (for example one in which all the reduced form explanatory variables were national variables) is not satisfactory, however good its forecasting record may be. One of the purposes in constructing regional models is to identify the internal structure of the regional economy, a purpose which often derives from a wish to identify regional policy variables and the effects of regional impact multipliers. An important aspect of this is the identification of intra-regional effects, which is of particular significance in Scotland. Moreover in a period of structural change, such as is presently taking place in the Scottish economy, it is unlikely that a purely satellite model, based on past relationships between the Scottish and UK economies, would prove a particularly accurate forecasting tool, let alone provide an adequate description of the structural characteristics of the economy. In summary, a regional econometric model is not viewed here

simply as a forecasting device but as a description of the structure of the economy - albeit at a fairly aggregate level - and as a tool for analysing the impact of policy instruments.

Secondly, at a more prosaic level the fact that the main inputs into the regional forecasting model are themselves forecast values of national variables, - sometimes subject to large prediction errors - obviously increases the scope for error, as well as raising the question of which set of national forecasts to take as "given" for the regional forecast. Of course, the high degree of openness of the regional economy means that this problem will always be with us, but it suggests that close attention to trends in regional variables might well pay off in reducing prediction errors generated by substantial reliance on forecast national variables.

Space prevents any more than this rather summary description of the characteristics of regional econometric models. For perhaps cautionary motives, emphasis has been given to problems rather than successes. However, while experience elsewhere has been too brief to permit extensive tests, the record of regional forecasting models in the United States compares favourably with many national forecasting models, and progress in that country is encouraging.

In recent years there has been a substantial increase in the volume of published economic statistics relating to Scotland, of which the most important are the estimates of Scottish GDP. However, one problem with most of the Scottish series - and one which is shared by other regions - is the lag in the publication of data series. This means that data series have to be updated before any forecasting can be made, and this in itself is a difficult task. We hope to do this by means of proxy variables, and part of our current work is being devoted to a search for and testing of appropriate proxy variables for GRP, industrial output and some other major variables.

Despite the notable improvement in published statistics for Scotland, we are still some way from the range of series required to construct a regional econometric model of any substance. However, this is not simply a plea for more and more series of statistics. Improvements in the quality of estimates,

in their frequency, and in the publication lag of established series can do as much to facilitate forecasting as the development and publication of new series. Secondly, there is in fact a good deal of information available about the Scottish economy in addition to those data published in official sources like the Scottish Economic Bulletin and the Scottish Abstract of Statistics. This includes information collected by trade associations, nationalised industries and government departments, which may not be published but which are available. There is therefore an important task in the systematic identification, processing and storage of available data series, and this presently constitutes a major part of our research time. Simultaneously, starting with a simple form of model structure based on an output-income accounting system, we are attempting to specify equations consistent with this structure and with the available data series. Two important criteria in this concern the disaggregation of flows by sector and by sub-region, though it is a very long way indeed to the construction of any kind of intra-regional model structure.

3. General Review

World events and prospects from January 1974

Events in the world economy since January 1974 have been dominated by the rise in the price of oil and other primary commodities which took place in 1973. The experience of almost every economy in the world since then has been characterised by adjustment to these events. When the quadrupling of the oil price took place at the end of 1973 it was widely believed that this would bring about an international monetary crisis, in consequence of huge trade surpluses being realised by the OPEC countries and corresponding deficits by the industrialised (OECD) countries. In fact, the very rapid rate of growth of imports of goods and services by OPEC countries coupled with a sharp decline in the demand for oil by the industrialised countries has led to a situation which the "petrodollar" surplus has been much less than had been feared. It is expected that by the end of 1975 the OECD countries taken together will have a collective balance of payments surplus on current account. World monetary institutions have shown themselves capable of coping with the problem of "re-cycling".