PROJECTIONS OF THE SCOTTISH ECONOMY TO 1984

Introduction

The October 1979 issue of this Commentary (Volume 5 No 2) included an article which described the outline structure of a Medium Term Model of Scotland, designed to be used for forecasts or projections of the economy for periods beyond the established 6-12 months of the Institute's short-term forecasting model. Since late 1979, work has concentrated on the precise formulation of the model, data collection, the estimation of the parameters of the model, and tests of its accuracy. In the latter part of 1981, the model was used to generate projections (or conditional forecasts) of the Scottish economy in 1984. Details of the construction and testing of the model, and of the 1984 projections are to be published shortly[*]. This article contains a synopsis of that report, emphasising in particular the results of the 1984 projections. For reasons of length, and of the orientation of this Commentary towards empirical and policy issues, description and evaluation of the estimation and testing of the model is limited; attention is concentrated on the results of the projections. Readers interested in the structure and estimation of the model are referred to the forthcoming report.

Objectives of the Model

The conception and design of the Medium Term Model (MTM) is strongly rooted in the processes and consequential problems of structural change which have occured in the United Kingdom, and in particularly acute form in Scotland, in the last few decades. If anything, these processes of structural change and the associated problems of adaptation have accelerated in the last five years. For this reason, the MTM is a multisectoral model which emphasises relative patterns of change in industry outputs and employment, the marketing and technological linkages between industries, changes in technology, and the occupational structure of the demand for labour.

In its most straightforward operational role, the MTM is designed to forecast the level of output and employment for individual industries in Scotland for any designated "target" year, including as necessary accompaniments to such forecasts other economic variables such as interindustry sales and purchases, imports (both from the Rest of the UK (RUK) and the Rest of the World (ROW)) and the level of (Scottish) Gross Domestic Product (GDP).

The term "forecast" is conditional in two respects. First, as a model concerned with the underlying trend of structural change in the economy the MTM is not concerned with (at least explicitly) the identification of turning points in the business or stockbuilding cycles and hence it is more appropriate to speak of forecasts **centred** on a particular year; thus a forecast for 1984 should be interpreted as a prediction of the average or

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[*] D Bell and others, The Development of a Medium Term Model for Scotland I: Projections to 1984, Fraser of Allander Institute, Research Monograph No 10, 1982.

trend level of output, employment, etc for the period 1983-85.   Short-term
fluctuations, the prediction of which is the essence of short-term
forecasting, may push actual levels of output and employment above or below
the trend levels forecast.

Second, the model is highly open and hence its forecasts are strictly
conditional on a wide range of exogenous factors which themselves become
less predictable the longer the time period.   For instance predictions of
Scottish exports to RUK and Scottish exports to ROW are partially dependent
on the future growth of UK GDP and exchange rates respectively.   For the
purposes of the MTM levels of these explanatory variables are "given" and
have to be independently projected for the target year.   The accuracy of
the MTM forecasts is therefore dependent on the accuracy of the forecasts or
assumptions made about the explanatory variables.   As the model is
developed, it is hoped to include within it (as endogenous variables) a
number of variables which are presently exogenous.   Both these conditional
aspects of the forecasts are reiterated below when discussing the results
for 1984.

Following from the above, an implicit but very important feature of the
model is its ability to simulate the consequences of alternative
developments in the "external" environment, some of which may be treated as
policy instruments, or which are responsive to policy changes.   In a modest
way this is illustrated by the results discussed below; three sets of
forecasts are made for 1984, each based on a slightly different set of
assumptions about developments in the exogenous variables (policy induced
and other) between now and the target year.

MINNOW

MINNOW is the name given to the present operational version of the MTM, so-
called because the number of sectors (16) is far less than that intended for
the "full" MTM (which will distinguish at least 40 sectors).   The sector
classification scheme used in MINNOW is shown in Table 1.

TABLE 1   MINNOW: CLASSIFICATION OF SECTORS OF PRODUCTION

    1. Agriculture, forestry and fishing
    2. Mining and quarrying
    3. Food, drink and tobacco
    4. Coal and chemical products
    5. Metal manufacture
    6. Engineering
    7. Leather, textiles, clothing and footwear
    8. Timber and furniture
    9. Bricks, pottery, glass and cement
   10. Paper, printing and publishing
   11. Other manufacturing
   12. Construction
   13. Gas, electricity and water
   14. Transport and communications
   15. Distribution
   16. Other services

The model is "driven" by forecasting final expenditures on the output of each of the industries listed in Table 1 and then solving the system of input/output equations to determine the output of each sector. The categories of final expenditure used are

(a)   Household expenditure
(b)   Government current expenditure on goods and services
(c)   Gross domestic capital formation
(d)   Exports to the rest of the UK
(e)   Exports to the rest of the world.

The estimated rates of growth in these final expenditure categories between 1979 (the latest year for which data are available) and 1984, along with estimates of import propensities in 1984, are the major determinants of forecast outputs in the forecast year.

Once outputs have been forecast, aggregate employment in each sector is determined through econometrically-estimated output-employment equations. The occupational composition of employment can then be estimated by means of an occupation-industry matrix, which records for each sector the proportion of employees classified to particular occupations.

Finally, the forecast levels of employment, allied with information on average earnings, can be used to estimate income from employment, which is the major component of gross domestic product. With varying degrees of success, other estimating equations have been developed to forecast the other components of gross domestic product (profits, rent). Consistency between the income and expenditure sides of the accounts is ultimately achieved through trade with the rest of the UK, which is thus partially a balancing item.

Tests of the Model

In order to test its performance, the model was run for the period 1973-79, using actual values of the exogenous variables (ie the final expenditure categories) for those years. In principle, since actual values of the exogenous variables are used, the model should replicate very closely (ie within the range of stochastic error) the actual levels of output and employment for those years. Significant and persistent deviations between "forecast" and actual outputs and employment would suggest mis-specification of the model or errors in parameter estimates.

In practice the results of such tests cannot be interpreted so unambiguously since the "actual" values of many of the exogenous variables are themselves subject to unknown margins of error. Thus differences between actual and forecast levels of output and employment for the period 1973-79 may be partly or wholly due to errors in the estimates of the "actual" final expenditure categories.

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In spite of these and some other reservations, the model performed
satisfactorily over the test period, particularly with respect to changes in
aggregate output and employment. At the individual sector level, output
and employment changes were tracked quite closely for most sectors, but in a
number of cases - chemicals, construction and utilities - forecast outputs
were consistently and significantly lower than actual. It is thought that
these differences are partly due to certain structural rigidities in the
model ie structural change between 1973 and 1979 was greater than that
allowed for in the model, and partly due to problems in estimating "actual"
final expenditures for the forecast years, particularly trade flows.   The
results of the tests have suggested areas for improvement in the model;
overall, however, the results were sufficiently good to justify the use of
MINNOW to generate "real" forecasts for 1984, results of which are discussed
below.

Scenarios for 1984

Estimates of output and employment in 1984 depend upon (a) the values of the
parameters of the model for that year, and (b) the projected values of final
expenditure for 1984.   The former may be discussed briefly.   The
parameters of a model (eg the propensity to consume, the propensity to
import, technical input coefficients) are subject to change and for
forecasting purposes it is desirable to allow for such changes wherever
possible.   Otherwise a null hypothesis of constant parameter values is
adopted.

For the present exercise three sets of parameters were modified for forecast
purposes. On the basis of recent UK trade statistics, import propensities
from the rest of the world were adjusted upwards, by trend extrapolation.
Similarly, changes in labour productivity were extrapolated to 1984 on the
basis of observed trends in productivity throughout the last decade.
Finally, a number of the input/output technical coefficients were adjusted
on the basis of observed changes in UK technical coefficients (derived from
UK input/output tables for various years).   All other parameters of the
model were assumed to remain constant, either because this appeared to be a
plausible assumption, or because there was insufficient information to
predict the direction and/or magnitude of change in parameter values.

Turning now to the forecasts of final expenditure, for the most part these
are closely related to expected developments in UK gross domestic product
and its principal components in the period to 1984.   Views on this differ
markedly, ranging from the extreme optimism of the Liverpool Group to the
extreme pessimism of the Cambridge Economic Policy Group.   Accordingly,
while rejecting as highly improbable either of these extreme views, we have
adopted a band of final expenditure forecasts based on three specific
"scenarios".   The first scenario, labelled 'Projection A', is developed
from the London Business School's UK forecast (Economic Outlook, February
1981), and can be termed "mildly optimistic".   The second is developed from
the UK forecast of the National Institute of Economic and Social Research
(National Institute Economic Review, November 1981), which can be viewed as
"mildly pessimistic".   This is labelled 'Projection B'.   The third
scenario, 'Projection C', is derived from an "in house" forecast for the UK
by staff of this Institute, and lies between the other two, though somewhat
closer to Projection A.

With respect to Projections A and B, it has been assumed that final expenditure categories (household expenditure, etc) will grow at the same rate as the corresponding UK category, except for Scottish exports to the rest of the UK which are estimated as a function of UK GDP. In the case of Projection C similar assumptions were made, except that Scottish exports to the rest of the world were estimated (on the basis of recent trends) to grow slightly faster than total UK exports. It should be noted that Scottish expenditure and output does not include the North Sea Oil region.

Estimates of final expenditure in Scotland, based on these scenarios, are shown in Table 2. Overall growth rates in real terms are low in all three scenarios - 0.60% p.a. for Projection A, 0.06% p.a. for Projection B, and 0.40% p.a. for Projection C, between 1979 and 1984. It should be remembered however that aggregate final expenditure in real terms actually fell in 1980 and 1981, and may be static in 1982, so that the average annual growth rates forecast above do imply a strong recovery in real growth in 1983 and 1984.

TABLE 2   ALTERNATIVE 1984 FINAL EXPENDITURE FORECASTS (£m AT 1975 PRICES)

	PROJECTION A	PROJECTION B	PROJECTION C	ESTIMATE 1979
Household consumption	6,530.0	6,243.5	6,299.7	6,176.7
Government expenditure on current goods and services	2,134.4	2,124.0	2,123.9	2,102.8
Investment (inc. stock changes)	1,934.6	1,817.7	1,810.0	1,964.3
Exports to RUK	4,102.8	3,992.3	4,126.4	4,069.3
Exports to ROW	1,791.0	1,784.1	1,951.9	1,699.9
Total final expenditure at constant market prices	16,492.8	16,015.6	16,311.9	16,013.0

Finally, comparison of the patterns of growth forecast by the three scenarios shows Projection A to forecast a relatively higher growth in household consumption and investment, while in Projection C exports provide the more buoyant element in final demand. All three scenarios predict a relative decline in investment between 1979 and 1984.

These differences in emphasis have identifiable consequences for the forecasts of output and employment in Scotland in 1984, to which we now turn.

Output Forecasts for 1984

Table 3 records for each scenario forecasts of gross domestic expenditure, the net trade balance and gross domestic product in 1984 (the net trade balance being the sum of the trade balance with the rest of the UK and the rest of the World).

TABLE 3   FORECASTS OF GDP AND THE BALANCE OF TRADE 1984

	GDE AT FACTOR COST	TRADE BALANCE	GDP AT FACTOR COST	AVERAGE ANNUAL GROWTH 1979-84 (%)
Projection A	9,309.0	-562.4	8,746.6	+0.26
Projection B	8,949.2	-449.3	8,499.9	-0.32
Projection C	8,943.6	-225.9	8,717.7	+0.10

All three scenarios predict that Scottish GDP will be roughly the same in 1984 as in 1979 - Projection A forecasts a small increase, Projection B a small decrease and Projection C virtually no difference.   As noted above, to achieve even this requires a fairly strong recovery in output in 1983-84. It will be noted that Projection C forecasts a much smaller adverse trade balance for 1984, arising from its assumption of stronger export growth.

Table 4 summarises the results of the forecasts for individual industries. In view of the differences between the MINNOW forecasts and the "actual" levels of production for the test period 1973-79, and the fact that MINNOW at its present stage of development appears to forecast **changes** in output more accurately than output **levels**, the data in Table 4 are expressed in terms of changes in output.   Specifically, they represent the percentage difference between the forecast volume of production for 1984 and the MINNOW estimate of the volume of production in 1979.

In all cases the utilities and services sectors are expected to have higher outputs in 1984 than in 1979, reflecting the relative change in purchasing patterns by both final and intermediate buyers (and, perhaps, a lesser degree of competition from imports).   Outside the service industries, only the food, drink and tobacco and - in two of the three projections - the agriculture, forestry and fishing sectors are expected to improve on 1979 levels of production by 1984.

The lower levels of output forecast for all other sectors can be attributed to three main factors; a generally very low level of real growth in final expenditures (a demand effect), particularly in investment, which directly affects industries such as engineering and construction; a (projected) increase in import penetration (a competitive effect); and a consequential very low rate of growth in the demand for intermediate goods, which directly affects intermediate goods industries such as coal, building materials, chemicals and paper and printing.

TABLE 4   FORECAST CHANGES IN PRODUCTION 1979-84

(Per cent change = ($\dfrac{\text{1984 volume of production} - \text{1979 of production}}{\text{1979 volume of production}}$) 100

	A	B	C
Agriculture, Forestry, Fishing	+2.3	-1.1	+2.4
Mining and Quarrying	-0.3	-3.2	-1.0
Food, drink and tobacco	+4.3	+0.3	+4.1
Coal & Chemical Products	-0.6	-3.2	+1.3
Metal Manufacture	-3.9	-6.1	-2.3
Engineering	-5.8	-7.5	-2.7
Leather, Textiles, etc	+5.7	-7.7	-3.6
Timber and Furniture	+0.2	-2.5	-1.3
Bricks, pottery, etc	-0.2	-3.3	-2.4
Paper, Printing, etc	-1.7	-4.7	-1.4
Other Manufacture	-1.2	-3.5	+0.8
Construction	-1.1	-4.0	-6.1
Utilities	+5.0	+1.1	+2.1
Transport & Communication	+3.7	+0.5	+2.2
Distribution	+5.4	+1.2	+2.0
Other Services	+4.1	+1.2	+2.3
Total Manufacturing	-2.0	-4.6	-0.5
All Industries	+0.5	-2.4	-0.1

Employment Forecasts for 1984

All three scenarios predict that total employment in Scotland will be lower in 1984 than in 1979, despite the fact that two of the projections predict slightly higher levels of output. The projected rate of growth of labour productivity, however, exceeds the predicted rate of growth of output.

Predicted **changes** in employment under each projection are given in Table 5. In manufacturing, only the food, drink and tobacco sector is forecast to increase employment (and, under Projection C, coal and chemical products). Substantial declines are forecast for engineering and textiles.

The predicted fall of 48,000 in manufacturing employment is almost offset by the predicted increase in non-manufacturing, particularly Other Services. This sector however contains a wide range of heterogeneous activities (including public administration and financial services), in which employment trends may be in opposite directions. It is consequently difficult to predict, though extremely important as a determinant of the overall demand for labour. The relatively modest increase in output predicted for the Other Services sector (Table 4) suggests that the employment forecast may indeed be biased upwards. For this and similar reasons which suggest that the labour productivity trends contained in the model may be underestimated, the employment forecasts reported may be over-optimistic.

TABLE 5   CHANGES IN EMPLOYMENT 1979-84 (THOUSANDS)

	A	B	C
Agriculture, Forestry, Fishing	-1.6	-2.0	-1.0
Mining and Quarrying	-0.2	-0.9	-0.2
Food, Drink Tobacco	+2.0	+1.5	+1.1
Coal and Chemical Products	-0.2	-0.9	+1.6
Metal Manufacture	-5.1	-5.9	-5.1
Engineering	-28.3	-30.6	-24.1
Leather, Textiles, etc	-15.8	-19.3	-11.4
Timber and Furniture	-2.0	-2.4	-1.9
Bricks, Pottery, etc	-1.6	-1.8	-1.7
Paper, Printing, etc	-4.8	-5.5	-4.4
Other Manufacture	-2.3	-2.5	-2.0
Construction	+6.3	0.0	+2.6
Utilities	+0.1	+0.1	0.0
Transport, Communicaion	-15.4	-17.3	-15.0
Distribution	-12.4	-9.5	-10.1
Other Services	+63.0	+50.0	+67.8
Total Employment	-18.3 (-0.9)	-47.0 (- 2.4)	-3.7 (-0.2)
Total Manufacturing Employment	-58.0 (-9.7)	-67.3 (-11.3)	-47.9 (-8.0)
Total Males	-30.9 (-2.8)	-48.6 (- 4.3)	-24.6 (-2.2)
Total Females	+12.6 (+1.4)	+ 1.6 (+ 0.2)	+20.9 (+2.4)

*Figures in brackets are percentage changes.

For reasons of length, estimates of the occupational demand for labour in
1984 are not discussed in detail here.   Of the twenty-six occupational
groups distinguished however, seventeen groups are forecast to experience
lower levels of employment by all three projections, and three groups to
decline by two out of three projections.

Small increases in employment are forecast for construction workers,
personal service and recreation workers, and administrative and managerial
workers, while significant increases in employment are forecast for
clerical, technical and professional occupations.   The largest falls in
employment are predicted to occur amongst engineering and allied trades,
textile and clothing workers, and transport and communications.

Summary and Conclusions

It is important to emphasise that while the output and employment forecasts
for 1984 (for which the three projections discussed give very similar
results) may appear discouraging, they do in fact imply a quite strong
recovery in the latter two years of the 1979-84 period.   This is simply to
underline the gravity of the recession from 1979 to 1981/82, and the growth
which is required to merely restore output, much less employment, to 1979
levels by 1984.

With respect to employment, the results of the forecasts lend support to the view that high levels of unemployment will continue at least until the mid-1980s. MINNOW at present does not include a labour supply component, so the model does not forecast unemployment levels in 1984, but it is clear from the estimates of labour demand that unemployment in 1984 will not fall significantly below present levels unless there is a sharp (and unexpected) rise in emigration.

With respect to output growth there are grounds for cautious optimism. If the recovery forecast for 1983/84 occurs - particularly the export-led recovery of Projection C - investment demand will become more buoyant, and this will sustain further growth in the latter half of the 1980s. On this view, there are prospects for a slow but sustained recovery in output and employment from about 1983 onwards. The prospects for recovery, however, must be qualified by the weakening of Scotland's manufacturing base which has occurred in the last five years.

Forecasts of output and employment for 1985 and beyond will be published annually and reported in summary form in this Commentary. In addition as the MTM is developed it is intended to produce at regular intervals detailed forecasts of output and demands for particular industries. Immediate goals are a more detailed industrial classification and analysis, a labour supply component, and development of the estimation methods for final demands and trade.