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CSO

FEBRUARY 1976

HMSO 60p net

STATISTICAL NEWS

Developments in British Official Statistics

A publication of the Government Statistical Service

Note by the Editor

The aim of *Statistical News* is to provide a comprehensive account of current developments in British official statistics and to help all those who use or would like to use official statistics.

It appears quarterly and every issue contains two or more articles each dealing with a subject in depth. Shorter notes give news of the latest developments in many fields, including international statistics. Some reference is made to other work which, though not carried on by government organisations, is closely related to official statistics. Appointments and other changes in the Government Statistical Service are also given.

A cumulative index provides a permanent and comprehensive guide to developments in all areas of official statistics.

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CENTRAL STATISTICAL OFFICE

FEBRUARY 1976

Statistical News No. 32

Developments in British Official Statistics

LONDON
HER MAJESTY'S STATIONERY OFFICE

Articles in recent issues of *Statistical News*

ISBN 0 11 723286 6

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NOTES ON CURRENT DEVELOPMENTS

Statistics of North Sea oil and gas

David J. Reid, *Statistician, Central Statistical Office*

Introduction

The arrival of the first significant quantities of oil from the North Sea over the last few months has prompted a number of questions about the statistics relating to activities on the United Kingdom sector of the continental shelf. These activities, which are part of the domestic economy, are comparable in scale with some of the largest industries and have been developing at an exceptionally rapid pace. It is pertinent to ask therefore what provision is being made to collect statistical data from the industry, what special problems are raised by the industry, and what effects can we expect to observe as a result of its activities in the national accounts and other industrial and economic statistics produced by the Government Statistical Service?

In terms of the 1968 Standard Industrial Classification we are discussing Minimum List Heading number 104 (MLH 104). This consists of exploration for and extraction of petroleum (ie mineral oil and natural gas), mining and retorting oil shale, and operating off-shore pipelines. It excludes land pipelines and terminals that are owned by associated companies in the mineral oil refining industry or the British Gas Corporation. At the time the 1968 SIC was drawn up the present structure of the industry was not foreseen so that the classification is not explicit about some of the range of ancillary specialist and supply services that have grown up around MLH 104. The SIC is currently under review and it is hoped that these ambiguities will be removed and gaps filled in the course of that revision.

Although attention is naturally focused at the present time on the off-shore activities of the industry, it should not be forgotten that there has been production of petroleum from small fields in the East Midlands and elsewhere for many years, figures for which in recent periods are published in Business Monitor PQ 104.

Statistical reporting

The existence of an established industry, albeit a mere shadow of the industry that is now taking shape, has, in the past, to some extent lessened the need for a re-examination of the way in which statistical information is obtained, but it has at the same time created additional problems in that the established industry is quite unrepresentative of the new one that is emerging. The metamorphosis has not been as dramatic as it might otherwise have been due to the development over the last decade of natural gas in the southern basin of the North Sea: in this case since the British Gas Corporation was the sole customer most of the statistical information needed was readily available.

Nevertheless there is clearly a need to review the adequacy of the existing statistical machine and the CSO together with other departments has recently been engaged in such an appraisal. Its principal concerns have been two-fold: to ensure that the conceptual treatment of this industry in the national accounts and balance of payments is consistent and well defined, and to ensure that the requirements for economic statistics on the industry are being met in as rational a way as is possible with due regard to the need for minimising the burden on the industry of providing information. This review covers only a small part of the total quantity of information provided by oil companies to government departments. In the first place we need to try to distinguish as far as possible the collection of information for statistical purposes from administrative returns which are collected by government departments in the discharge of their statutory duties, some of which involve collecting a good deal of quantitative and indeed financial information. The remit of the Survey Control Unit in the CSO, which is responsible for ensuring that unnecessary duplication on questionnaires is avoided and that the total burden of form filling on industry is not unreasonable, extends only to statistical inquiries and the present review has been similarly limited. Secondly, we have excluded inquiries that extend wider than MLH 104 where disruption would arise if an attempt were made to collect information on this industry separately. Thirdly, we have been concerned only with information required for the national accounts and the system of industrial economic statistics. The Department of Energy has also been developing a computerized system of monitoring physical quantities of petroleum – production, stocks and disposals – and the two systems are complementary.

As a result of this re-appraisal a new quarterly inquiry is being planned. Within the limitations mentioned above, this will rationalise existing statistical returns and collect supplementary information where deficiencies have been identified in the present system. One outcome of this will be the construction on a regular basis of a production account for MLH 104 covering expenditure and receipts in much the same way as the trading account of a firm does. This will provide information for the national accounts whose consistency between the various measures of the value added (expenditure, income and output based) can be checked.

We have been considerably helped in our review by several major oil companies who have given time to talk to us about the structure and modes of operation of their industry. Some have explained the basis of their accounting system so that we would be better able to frame questions to minimize the burden on companies, yet still obtain useful information. We are acutely aware that the overall burden of form filling is particularly heavy for firms in this industry and are sympathetic towards the problems that it poses. This dialogue is important since it can only lead to a better understanding and an improvement in the quality of the resulting statistics.

Problems raised by the industry

Let us now turn to the special problems raised by the industry. There are four main headings under which these might be arranged: problems of definition and conceptual treatment, the unique position of off-shore activities with respect to the balance of payments, the unusual industrial structure, and problems associated with the size and rate of development of the industry.

Definitions and concepts

(a) *Territory*

Domestic territory includes the undersea extension of the United Kingdom on the sea bed (and any subsoil assets beneath it) which is defined by international convention. In some areas the median line has not yet been agreed, but no licences have been issued in these areas. For pipelines, rigs, production platforms (and fisheries) the criterion is the same as for ships, namely that of ownership. With a few exceptions, fixed installations such as pipelines and production platforms are domestic assets since they are owned or operated by the licensees who are required to be UK resident companies.

(b) *Capitalization*

Discussion with companies indicated that a number of traditional questions in statistical inquiries raised special problems for MLH 104. The most important, in terms of the effect on published figures, were questions on capital formation. The normal practice for other industries is to rely on the allocation by companies of expenditure between current and capital account as this produces figures that correspond closely with the national income accounting concept of gross domestic fixed capital formation (GDFCF), and figures that are consistent with estimates of profits based upon data from corporation tax sources. In MLH 104, however, the concept of fixed assets is less clear, and individual companies vary in their approach to capitalising certain exploration expenditures.

Companies are involved in three types of activity; exploration, development, and production. Expenditure on exploration is analogous to research and development expenditure (although at this stage of the industry's development its importance is relatively greater than that of R and D in other industries) and is undertaken in order that a company may maintain its stocks of proven reserves which would otherwise be depleted as production takes place. These reserves are not part of the tangible assets of the company, indeed under the terms of UK licences they are not even owned by the company, so that in national accounts terms it would not be appropriate to regard exploration expenditure as part of GDFCF; however items such as drilling rigs that are purchased in order to undertake exploration activity and yield a service over a number of years should be so classified.

When a commercially viable find has been made, a decision has to be taken on whether to develop that find and eventually produce from it. At this point the company enters the development phase of operations. Figures for GDFCF in MLH 104 consist of all expenditure on developing proven reserves *plus* the purchase of fixed assets for any use including that of exploration. In this industry, as in others, only owned assets are included in GDFCF. Leased or hired assets are excluded and attributed instead to their owners.

Classification of capital formation into types of asset also requires some clarification for this industry as it is by no means obvious how, for example, drilling rigs and production platforms should be treated. In the national accounts tables, drilling rigs, specialized barges and other floating structures are included with ships; production platforms (but excluding modules which are included with plant and machinery), wells and pipelines are regarded as new building and works.

Balance of payments

The territorial concept mentioned above has implications for the information required to complete the

balance of payments accounts. The normal system for collecting information on foreign trade transactions operated by HM Customs and Excise whose jurisdiction extends only to the three mile limit, is based on movements of goods through ports and airports and does not cover all the international transactions involved: shipments to the continental shelf, like coastal trade, are excluded. There are several types of supplementary information which has to be collected to ensure correct entries in the UK balance of payments accounts. In the first place goods delivered direct to off-shore installations from foreign ports without passing through the United Kingdom, and eventually any exports of oil that are not routed via the United Kingdom, need to be covered. Imports delivered directly to off-shore locations consist not only of regular supplies to rigs and platforms delivered by boats operating from foreign ports, but, more importantly, imports of production platforms and associated equipment that are towed direct to site. Also materials and equipment are sometimes imported (or exported) aboard rigs and drill-ships entering (or leaving) United Kingdom waters in order to carry out work.

Secondly much of the work done is in the form of services provided by non-United Kingdom resident contractors. Information on imported services has to be collected for inclusion in the 'invisibles' component of the current account. The type of service covered includes hire of equipment, consultancy, drilling, surveys, pipelaying, diving, etc. The distinction between goods and services is not always clear and the value attaching to some goods will include a service element (for example certain design costs) whilst some services will be valued inclusive of goods consumed during the provision of the service.

A drilling contract with a non-resident may be priced inclusive of all materials used, whence it follows that supplies obtained from the United Kingdom by the non-resident contractor (for example, well casings, etc) should be recorded as United Kingdom exports (and as a corollary, supplies obtained direct from foreign ports should not be recorded as imports). The cost of imported services would then embrace the goods he had utilized. On the other hand a contract may provide that the UK-based operator supplies necessary materials to the overseas contractor, in which case any goods delivered to the contractor from the United Kingdom should not appear as exports (but any delivered direct to the contractor from abroad should be included in UK imports!).

This discussion illustrates that although most of the concepts are clear the problems of collecting information to reflect the economic reality and flows of real resources are substantial.

Industrial structure

Concepts used in the collection of industrial statistics such as the 'enterprise' and the 'establishment' need to be re-examined in the context of MLH 104. The typical situation is for a group of companies to form a consortium which then applies for a licence to explore and produce petroleum within specified areas (blocks). The partners in the consortium nominate an operator (normally one of their number) who is responsible for all work on the licence area. He is reimbursed by his partners for all expenditure undertaken on their behalf, and he distributes any petroleum won between them according to their respective shares in the consortium. Thus the operator will be the most knowledgable member as far as expenditure is concerned but he may not know the value of sales of oil by his partners.

In setting up a statistical system one of the first decisions to be taken is what will be the reporting units. In this case, approaches based on returns sent to each company involved would have two major disadvantages. It would often be difficult or impossible for companies who are not the operator to provide the information on expenditure required. They would have to consult the operators for the various consortia in which they had a stake and the total burden of form filling would be greater than it need be. Secondly there would be a danger of duplication in reporting expenditure by operators and by their consortium partners.

To avoid these difficulties, returns are to be sent to operators in respect of the licence blocks that they operate. Administrative records provide a complete list of operators and there is no duplication. However, since the operator does not usually know the value of sales by his partners, it is necessary to ask for supplementary returns from all partners in producing fields; these are restricted to value and volume information on their sales of petroleum. The volume information, when matched with total field disposals reported by the operator, provides a check on coverage. In addition to licence holders there are a number of other businesses that are classified to MLH 104. These include drilling andother specialised contracted services, and enterprises related to activities carried out in licensed areas such as the operation of pipelines and certain terminal installations. Also many oil companies have activities (eg supply work and services) that cannot be allocated to individual licence blocks. Under the new system, separate statistical returns will need to cover all these activities in order to complete the coverage of the industry.

Size and rate of development

The rapidly changing technology, and sheer size of the amounts involved, mean that the statistical system

must be accompanied by a more than usually vigilant monitoring of activities and scrutiny of returns so that these may quickly be modified, as necessary, to reflect the changes in economic activity. These factors also rule out, for the present, the use of sampling techniques that are widespread in other industrial inquiries. On the one hand the fields being developed are few and involve very large amounts, so that complete coverage is necessary. For exploration work, on the other hand, the number of blocks is quite large, but it is difficult for operators who are working several blocks to allocate expenditure between them and in any case in any single period the number of blocks in which major activity is taking place (for example drilling) is also quite small.

Impact on the national accounts

Some of the most important series in the national accounts are being substantially affected by the development of our off-shore petroleum resources, although it is often difficult to identify accurately the 'North Sea' component in the aggregates.

Gross domestic fixed capital formation is probably the area where the effect of the industry is most direct and obvious at the present time. Indeed this is the only major industry group where the volume of investment is estimated to have been consistently increasing over the last 2 years and it has contributed about 8 per cent of total GDFCF over recent quarters. Last summer saw the installation of several production platforms costing in some cases up to £100 million. These highlighted the fact that we are dealing with a series that on a quarterly basis is likely to show a substantial variability. This is the case especially when the equipment concerned is imported because then it is recorded as GDFCF *at the time of arrival* for consistency with the recording of imports; whereas for United Kingdom produced equipment the expenditure is more smoothly spread out because it is recorded as GDFCF on a *payments basis:* for the major items payments are usually spread over the course of their construction.

On the income side of the accounts the major impact of the industry will be on gross trading profits. Up until now, when exploration and development have dominated, the effect on the industry and on the total for all industries has been to depress total profits as current spending has been higher than revenue. As major oil fields build up to full production this position is likely to be reversed and profits (which in the national accounts are measured before deducting interest payments and taxation) will start to make a positive contribution to gross domestic product.

Government tax-take from profits will consist of 3 components: royalties, petroleum revenue tax, and corporation tax. Apart from royalties which will be paid on well-head value as petroleum is produced, the Exchequer receipts from petroleum revenue tax and corporation tax are likely to be distributed over time differently from gross profits. Companies will be able to set against profits their allowances for exploration and development expenditure early in the life of the field so that tax receipts are likely to build up only after several years of production. In addition some revenue is obtained from licence fees.

Finally the balance of payments accounts reflect a number of transactions. Imports of goods and services associated with the exploration, development and operational activities on the continental shelf include some major items of equipment such as production platforms. Because their full value is recorded in visible trade in the month of arrival they produce noticeable irregularities in the current account during the summer season. Progress payments made to overseas during the course of their construction and trade credit received on their arrival are recorded in investment and other capital flows at the time the financial transactions take place. Financing of other very large exploration, development and operational expenditure results in other capital inflows; out flows can be expected in respect of interest and capital repayments during the life of the fields when we may also expect a reduction in oil imports and increased exports of crude oil and petroleum products.

The net effect on the current account of the balance of payments of exploiting our off-shore resources will therefore be a combination of several factors whose relative importance will change over time.

Conclusion

It is a rare event for a new industry to be established and this one has posed some particularly interesting and unique problems. The steps that are being taken to overcome these and the treatment being adopted in the system of economic statistics has been set out above. It is hoped that the new inquiries to be launched will provide information to meet the statistical needs of government, industry, commerce, academic research and the interested layman.

Price indices in the construction industry

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Introduction

Demand for price indices in many spheres has been emphasised in recent years as the rate of price inflation increased substantially. The construction industry, in common with most other sectors of the economy, has experienced a considerable inflation of prices. Tender prices for some types of building work rose by 40 per cent or more during 1973 reflecting both the impact of increased wages and material prices and high pressure of demand for construction resources. Subsequently, the reduced pressure on resources during 1974 and 1975 has been associated with tender prices rising more slowly than material and labour costs.

This article discusses the importance of indices of construction prices both for Government and as a part of the relationship between contractors and clients. Government requires indices as a part of the information used in the development of its policies towards an industry for whose products it is a dominant customer. Indices are also used to adjust contract prices agreed between contractors and clients to take account, where appropriate, of the effect of inflation on contractors' costs.

Different approaches to index number construction are used depending on the purpose to which the indices are put. For government uses, indices of tender prices are more appropriate whilst for contract price adjustment, indices of input costs are required. The article discusses the various ways in which tender price indices can be compiled and examines the various indices which are either already being produced or are in the development stage. The way in which price indices of material and labour are used for adjusting accepted tender prices for different types of building work is also considered.

The need for indices

Government needs price indices for several purposes. First, revaluation of expenditure, output and new orders figures for construction work is essential for the analysis of 'real' developments in the industry. This is necessary to provide an adequate framework for forecasting future developments and in assessing the development of the economy generally. Secondly, price indices compared with indices of contractors' costs provide some indication of the pressure of demand on construction resources; prices rising faster than costs when there is overloading and more slowly when demand is slack. Thirdly, public expenditure programmes may be planned in 'constant' price terms: that is fixed volumes of services to be purchased. Control of expenditure fixed in these terms must be through indentifying the money expenditure which is required to purchase the services. Alternatively, an annual 'cash ceiling' may be set for the coming financial year's programme on the basis of forecasts of expenditure prices available at the time. If expenditure prices increase faster than expected, the volume of services purchased is less; if prices rise more slowly, extra services may be purchased. Cash ceilings are set for many construction programmes and the expenditure price level is forecast on the basis of the price levels of tenders already accepted when the limit is set, forecasts of future movements of tender prices and the expected cost of price adjustment clauses where appropriate.

As well as being controlled on an aggregate level, many public sector programmes are also controlled at the project level by cost limits (for example schools, hospitals): tender price indices are used as a basis for adjusting these limits to take account of inflation.

Before January 1974, government policy was to require contracts for public sector construction work to be on a firm price basis unless the work was expected to take longer than 2 years to complete. The lowering of this threshold to 12 months has led to many more variable price contracts and has made it more difficult to interpret tender price movements: to do this it is necessary to estimate the effect of the change in tendering policy. This is usually done by estimating the size of additional price adjustment payments which will be made on variable price contracts – in effect, to establish the price levels which would have prevailed without the change in contracting procedures. An analysis of these additional payments in conjunction with observed movements of tender prices for fixed and variable price contracts also provides a basis for assessing the effect of the change in contracting procedure on the cost of public sector construction work.

In addition to the Government's need for price indices, discussed above, price indices are now increasingly used for contract price adjustment. With the acceleration of inflation, contractors became less willing to undertake contracts at fixed prices because of the increasing impact of rises in the cost of materials and labour between tender and the execution of work on the site. Contractors had to quote prices which included an allowance for the inflation they expected. If inflation proved to be greater the contractor's profit margin would be reduced or could be eliminated. During the last couple of years, both public and private sector clients have increasingly accepted the incorporation of price adjustment clauses into contracts and the lowering to the threshold for firm price tenders for public sector contracts to 12 months was an example of this change. These changes have shifted much of the risk caused by uncertainty about the rate of inflation from the contractor to the client.

Types of price index

There are two distinct types of price index used in the construction industry reflecting the different purposes to which indices are put. First, indices are required which reflect trends in contractors' identifiable costs – materials, labour and plant. No assessment is made of overheads and profits. A number of indices of this type are published regularly and are used to adjust contract prices for different types of building work. The compilation of these indices is discussed later.

The second type of index measures the cost to the client of construction work; or, in other words, the prices which contractors charge their clients. These prices incorporate the margins which contractors include in their tenders to cover overheads and profits. Indices of this type are most important for Government because it requires information about the cost of construction work both as a client of the construction industry and because such expenditure forms a major item of public expenditure.

Indices of a cost to the client take two forms: first, indices of accepted tender prices and secondly, indices of the cost to clients of work being undertaken in a given period. The latter reflects the price of tenders accepted over a number of previous periods – adjusted, where appropriate, to take account of any price adjustment clauses included in the contracts.

As well as using lagged tender prices, indices of the cost of work to clients can also be compiled from data on the cost of materials, labour, overheads and profits. Information on material prices may be collected from manufacturers; on labour costs from analyses of earnings or examination of wage agreements adjusted, if necessary, for productivity changes; data on overheads and profits are very scarce – particularly if up to date information is required. This approach is the basis of the DOE Cost of New Construction Index published in *Housing and Construction Statistics*.

In a tender price index, all inputs including overheads and profits are automatically taken into account. This is the major reason why DOE is developing a range of tender price indices. Other advantages are the relative ease of producing up to date figures and their use as forward indicators of output price trends. Tender price indices are all based, of course, on data derived from actual tenders but there are various methods of analysis and three of these are discussed below.

Repricing

The largest items in each trade in a bill of quantities can be repriced using a schedule of prices appropriate to a fixed date in the past: thus this type of index in effect uses current weights. By grossing up, the total cost of work in each trade at the schedule prices can be estimated leading to an estimate of the total cost of all the work in the contract (including standard allowances for preliminaries, water and insurances, etc) which can be compared with the actual tender price to give an individual price index figure for each contract. An assessment of overall price movements is obtained by calculating, for each period, the mean of the individual contract index figures. An equal weighting is usually given to the price index figure for each contract let, but other alternatives are, of course, feasible.

However, considerable resources are required in establishing an extensive schedule of prices for the base period for repricing purposes; and, typically, someone with experience in quantity surveying techniques will spend a day or more repricing each contract. Also arrangements must be made to have access to bills of quantities and contract specifications.

The DQSD building tender price index is the only one which has been produced on this basis regularly for a number of years. The index is produced by the DOE/PSA Directorate of Quantity Surveying Development (DQSD) and about 80 contracts are analysed each quarter of which about one third are contracts let by central government and the others by the Post Office. Items are repriced until 25 per cent of the total value in each trade has been covered.

The Building Cost Information Service (BCIS) of the Royal Institution of Chartered Surveyors is developing a repricing index of the building prices in tenders for both public and private sector clients. DOE have contributed to the substantial cost of this exercise for the initial two years in order to launch the project. Bills of quantities are obtained from private quantity surveyors who are members of the BCIS. Quarterly

index figures, each based on about 80 contracts have been produced since the beginning of 1974.

A similar index for local authority non-housing building work is being developed by DOE in co-operation with the Department of Education and Science, Department of Health and Social Security and the Home Office. Local authorities were first approached in 1974 for the loan of copies of bills for a sample of primary schools' social service buildings and police buildings. The number of these contracts in the early stages was too small to produce a reliable index and action has been taken to increase the sample to 80 per quarter. Index figures will be produced for the first two quarters of 1973 and for 1974 onwards.

Developing of a repricing index for the water services construction programme is also being investigated. This would probably require the production of a separate price schedule for civil engineering work, whereas a common price schedule can be used for repricing building tenders.

Basket of goods

An alternative approach is to devise a 'basket of goods' comprising a selection of items which occur in most bills of quantities for a type of building. The average price for each of these items is calculated from bills relating to a given period and price relatives are obtained for each item by comparison of the average in the current quarter with the average price in the base year. The price relatives are then weighted together to produce an overall index figure using base-year weights. This approach requires much less data than the repricing one but it is more suited to those sectors where there are a large number of contracts for buildings of a relatively homogeneous type and using similar construction methods.

An example of this type of index is the Price Index of Local Authority Housing which was described in *Statistical News No. 22*. This is constructed from an analysis of the prices of 23 items extracted from bills of quantities for one and two-storey houses of traditional construction. The price data are extracted by the quantity surveyors employed by the authorities who return them to the Department on a standard form each quarter.

An annual roads tender price index has been produced for several years on a similar basis; however, the greater variability of the price data being analysed makes it difficult to produce adequate quarterly values and work is proceeding on the production of a repricing index.

Regression

A third method of producing a tender price index is by way of a regression model. A model explaining building cost in terms of various parameters which describe the nature of particular projects is developed. The co-efficients of this model are estimated for the base-year and this 'base year' model is then used to predict what the price of contracts carried out in the sample period would have been if they had been let in the base-year. Comparison of the actual price and the base year price predicted by the model provides a price index figure for an individual contract. Quarterly figures are then produced as an average of the price index estimates for individual contracts. This approach is conceptually similar to the repricing one except that the base price of the individual contract is predicted by a regression model rather than estimated by repricing a sample of items in a bill of quantities at a schedule of prices for the base year.

No indices on this basis are produced regularly by DOE. A model based on available data for sewer laying contracts displayed a high level of variability and it appears that this outweighs the disadvantage of the greater amount of work necessary for the repricing index referred to earlier. Research by Loughborough University has been financed to examine the feasibility of this approach in the mechanical and electrical engineering field where the repricing approach is not a practical proposition. A mechanical and electrical tender price index based on this method seems likely to have a high variability relative to the repricing indices already produced for the building industry and a decision whether to produce such an index has to be taken after weighing its possible value against the likely variability.

The formula method for the building industry

The more widespread use of contract price adjustment in the building industry has been linked to the introduction into building of a formula method of reimbursement for increased costs. Previously, on contracts where price adjustments were made these were generally based on detailed evidence of each price change submitted by the contractor. This involved extensive work not only for builders but also for clients' staffs who had to check claims. Further, the recovery of increased costs was incomplete because some costs were not covered by price adjustment clauses – a factor which also contributed to uncertainty for the contractor about the proportion of his cost increases for which he would be reimbursed. Following pilot studies by the Property Services Agency of DOE on behalf of the NEDO Economic Development Committee for Building, the

latter established a Steering Group to develop a workable system of price adjustment on a formula basis. The principal advantages were seen as a saving of staff effort, reimbursement more commensurate with true price movements, speedier reimbursement of increased costs, and greater confidence in tendering during a period of rapid inflation.

The NEDO price adjustment formula for general building work is based on 34 indices covering the cost of different work categories eg brickwork, flooring, etc. Each of these indices is in turn derived from indices representing movements in the cost of skilled labour, unskilled labour, plant and various materials and which are combined using appropriate weights to provide an overall measure of price movement for the work category. The labour indices are based on national wage agreements; the material indices are a selection of the wholesale price indices compiled by the Department of Industry from price data provided by manufacturers; the plant index is a combination of the labour indices and appropriate DI material indices.

There are other formulae for some types of work always undertaken by specialist sub-contractors. Each of these consists of separate material and labour indices appropriate to the particular industry.

On a contract to which the formula method is applied, the work is allotted between the 34 categories (and specialist formulae). Similar apportionments are also made at each interim valuation of work executed to enable separate assessment of price adjustments to be made for each category on the basis of the index movements between the 'base' month of the tender and the 'valuation' month. The works category and specialist indices are calculated monthly by DOE/PSA and published by HMSO.(1)

In order that this new method of price adjustment should be fully understood, the Government set up an advisory committee including representatives from the building industry, the professions, public and private sector clients and the DOE Directorate of Quantity Surveying Development as well as the Government Statistical Service to consider issues arising from the compilation of the indices. Two academics also serve on the committee as independent members.

Formula price adjustment for civil engineering contracts

Price adjustment on civil engineering contracts is based on a simpler formula. There are a small number of indices representing the cost of labour, the principal materials and plant. Price adjustment on all work done is based on an average of the movement of these indices calculated with weights set by the client's engineer at tender stage. There is an advisory committee which carries out a similar function to that undertaken by the committee concerned with the building formulae.

Conclusion

Inflation makes the planning and control of many activities more difficult and price indices are developed to attempt to overcome or at least reduce these difficulties. The recent rapid inflation in the economy has been accompanied by substantial, and often quite sharp changes in relativities. The latter has been an important feature in the construction industry and has emphasised price index requirements both in central government for planning and controlling expenditure and in the public and private sectors generally for contract price adjustment.

During the last 5 years, not only have tender price indices for some types of construction work moved very differently from prices in the economy generally, but the available indices suggest that there have been substantial variations in tender price movements within the industry. Such variability in inflation rates makes it important to develop appropriate indices for different sectors because the application of inappropriate indices can lead to substantial errors in estimates of the extent to which changes in public expenditure reflect changes in prices and changes in volume. Therefore, the Department of Environment have widened, and are continuing to widen, the range of tender price indices compiled.

Similar problems face the private contractor who finds it difficult to anticipate the cost of undertaking work during the period when inflation is irregular and unpredictable as well as rapid. To plan for an adequate return on capital on longer contracts, he needs to know that his reimbursement will be related in a systematic way to his costs. The importance of price adjustments assessed by a formula being based on indices appropriate to the type of work being undertaken has been stressed by the sharp changes in the relative price of different materials over the last 3 years. Some builders, especially those undertaking very specialised work, believe that the categories – the composition of which was determined from the analysis of 50 bills of quantities selected as representative of building work generally – are not sufficiently representative of their work. To ensure that the categories do reflect, as far as technically feasible, the experience of builders, a comprehensive review of the indices is now being undertaken.

Reference

(1) Monthly Bulletin Construction Indices for use with National Economic Development Price Adjustment Formulae (HMSO) (Prices various).

Indicators of local prosperity, data bank

S. L. Edwards, *Senior Research Officer and* **Mrs. M. Pender,** *Assistant Research Officer, Department of the Environment, South West Regional Office*

In 1971, using the South West Region of Great Britain as a trial area, an attempt was made to construct indicators of prosperity in the various parts of the region. As the exercise proved successful in producing five or six principal dimensions of well-being, it was decided to extend the work to cover the whole of Great Britain.

The original objective of the project was to measure local *prosperity* but as the work progressed it was found that a number of variables could be included that were far removed from concepts of income or wealth, which the word 'prosperity' conjures up. The aim of the project may now, therefore, be redefined as establishing social indicators of territorial well-being in the various parts of Great Britain, but having dubbed the project by its former name in the various published lists of research projects to avoid confusion this title will be retained.

The purpose of establishing such indicators may be briefly stated as follows:—

As input to regional planning

To assist in the formulation of regional policy and monitoring its effects.

To assist county structure plans.

To establish national norms on particular indicators.

To assist in policy formation on the allocation of resources.

To provide a base from which to judge the effects of the various EEC policy measures.

To aid central government policy on rate support grants to local authorities.

With the completion of the first stage of the project, which was, simply, amassing data – collection would be a misnomer as no special surveys were undertaken and only existing sources of statistics were tapped – it may be useful to record the problems encountered in the endeavour to set up a data bank with a common areal classification for all the statistics used.

The lists of variables included and their sources is given in the Appendix. On the question of choice of variables, the report on 'Indicators of Local Prosperity in the South West Region' (1) probably puts this best:

> 'The choice of variables inevitably has an arbitrary element, and all that can be claimed is that the selection of input series was determined by the need to cover as wide a variety of aspects of social and economic well-being as possible within the range of data available, and not by any preconceptions as to the basic dimensions of prosperity or the desire to produce forceful factors'.

Twenty-two of the variables were derived from the 1971 Population Census and since they were extracted from library tapes by computer programme and were classified to the areas required, *viz*, the 1,700 or so old local authority areas, the collation was relatively easy. One other, the index of industrial building was also derived from computer tape. The remaining 25 were derived manually from a variety of sources, most of which were government departments, who collect the information for their own purposes and often for areas that, understandably, differ from local government boundaries. It was necessary to adjust those variables to conform to the local authority areal classification. In the following paragraphs this adjustment process is explained; but to complete the backcloth, a few general points need to be covered. The project was confined to Great Britain as the inclusion of Northern Ireland would have introduced some difficult questions of comparability. Indeed, as will be seen, the inclusion of Scotland has not been without its problems and some variables will have to be excluded when it comes to comparing social well-being in Scotland with that in England and Wales.

The year 1971 was chosen as the base mainly because that was the year of the latest census of population and thus most other data are for that year or as near to it as possible. No time series have been built into the data; only cross-sectional analyses can therefore be undertaken. But, this is a fault that can be remedied with time, as many variables are available on an annual basis.

The choice of area was the old, pre local government re-organisation local authority, again mainly because this fitted in with the main single source of data (the population census) but also partly because there was

no consensus of areal classification amongst the other sources. However, codes were incorporated in the programme to enable the data to be aggregated to the new local authority districts, counties, sub-regions, regions, the standard metropolitan labour areas, city regions and the 'assisted areas' of Britain. The conversion of population data from old local authority to districts was made using information from the Office of Population Censuses and Surveys; for other variables it was assumed that they disaggregated in the same way as population for this particular exercise of aligning old authorities with the new.

The data are stored on an ICL 4130. Readable format is FORTRAN and although for the most part only derived variables are included on the indicators tape, for example solicitors per thousand population, in the case of variables from the population census both original and derived variables are included.

Future work will be concentrated on the classification of areas of Britain by level of social well-being; for an account of the purposes and objectives of the exercise and a fuller discussion of the choice of variables see 'Local Indicators Project' (2). As a start, the overall national picture will form the norm, but it is probable that regions may wish to examine differences within their boundaries with regard to the regional norm. Thereafter, or to some extent concurrently, the data will be used for a number of other projects; for example it is intended to link it with data on migration in the hope of developing improved models of inter-regional migration. Additionally research colleagues at the University of Kent intend using the bank to study some of the basic theoretical issues concerning social indicators, for example the significance of particular indicators in both time series and cross sectional contexts and the type of causal framework which would be required, particularly if indicators were to be used for monitoring or prediction.

Problems encountered

As the reader will notice, two variables are derived by the use of proxies. These are income and male earnings. At present, no information on income is available below county level and earnings data are restricted to counties and certain urban areas. To derive a statistic for areas as small as the old local authority areas, income and earnings levels are correlated with a number of independent variables, for example female activity rate in the case of the former, proportion of professional and managerial workers in the case of the latter, their significance ascertained and the value of the independent variables allowed to determine the dependent one. For further details as to the general methodology see (1). Two further variables, *viz*, crime rates, as represented by figures for violence against the person and crimes against property, and children in care per 1,000 persons under 18, could not be disaggregated below the level of the county and main urban areas either by perusal of the statistics or by the use of proxies. The number of university entrants was also not available below county level.

The attempt to allocate the number of telephone connections – the measure of telephone ownership – to local authority areas was not wholly satisfactory. Figures were obtained from List of Exchanges published for internal purposes by the Post Office and even with the aid of maps kindly supplied by their marketing department, fixing boundaries proved somewhat arbitrary. Thus, the data about telephone ownership by local authority area are not particularly reliable, though when aggregated to counties they should be more satisfactory.

Information on doctors' average list size was obtained from index card records referring to the changes in doctors and patients for each practice in each Executive Council area. Again, there were difficulties in establishing boundaries and a further complication was that people tend to register with a doctor only if they require attention. Thus, if they move away from a practice they will not re-register with another until they fall ill and will still appear on the old doctor's list. Allowances are made for this but accuracy cannot be guaranteed.

Domestic and total rateable values were obtained from *Rates and Rateable Value* publications for England and Wales, and Scotland. Houses with high or low rateable value were obtained for England and Wales from the relevant forms kept by the Department of the Environment, but Scottish local authorities do not collect this information so that these variables do not appear in the data for Scotland. The definition of high and low was arbitrary, depending on the presentation of the data on the relevant forms; high was defined as over £100 and low as under £30. It was also impossible to include the variable 'Solicitors per 1,000 population' in Scotland's case as the relevant publication could not be traced in time.

Infant mortality and death rates were taken from the Registrars Generals' return for 1971. Since a single year's statistic may not have been representative, death rates for 3 years, 1970 to 1972, and a 5-year average of infant mortality rates per thousand live births were taken, though in the latter case, because of the smallness of the areas, some odd values remained. No technical problems were encountered with the variable 'illegitimate births per thousand live births' but in some sparsely populated areas, especially in Scotland, odd values occurred. For example the rate was very high if, for example, there were only three births in 1971

and one was illegitimate. Because of the lack of success in smoothing the data with the infant mortality variable, no attempt was made to cover a run of years in order to overcome this problem.

The variables covering percentage polls in elections were intended to give an indication of willingness to participate in the political process. Figures for the general election were obtained from the Command Paper on electoral expenses and the number of votes cast in each local authority (which coincide with constituency boundaries in most cases) were taken as a proportion of the population entitled to vote (that is over 18) rather than as a proportion of registered electors, since many people do not even register as electors. Local election figures are given in the Registrars Generals' Return; these show the percentage of the registered electorate which voted in those wards where an election was held and are not related to the eligible population. Where an election had not taken place in 1971, the nearest election to that year was taken.

The source of the sole index of pollution, that is sulphur dioxide air pollution, was Dr Gilbert of Sheffield University from his map of pollution, based on school children's observations of lichen growth.

The variable that required the greatest number of amendments was 'post war housing'. Statistics are readily available for England, Wales and Scotland from 1945 to 1971, but a number of adjustments had to be made to them to take account of boundary changes, government housing, houses built by one authority in another and the location of new towns. There have been several changes cf local authority boundaries since the war. Each year's housing return accommodates the changes that have occurred during that year, but to locate housing in the authority in which it stood in 1971 necessitated amending each year's returns for the boundary changes that had occurred in subsequent years. This was done *pro rata* to population movements resulting from boundary changes – figures for which are available in the Registrars Generals' Return. Houses built by government agencies for their employees, for example police, armed forces, forestry commission, are included in the housing figures for Scotland 1945–1971, but for England and Wales only from 1966 to 1971; the latter data are not available pre-1966. It is not possible to separate the number of houses built by government agencies from the rest in order to make the series comparable.

No adjustment was made for this difference in the figures for England and Wales, and Scotland, especially as it is believed the total numbers involved are small.

Houses built by one authority in another authority (mainly overspill from London, Glasgow and other major cities) were however subtracted from the authority which paid for it and added to the authority that received it. Also, in the case of new towns, which are often located at the boundary of several local authorities, public sector housing can be divided between the constituent local authorities in proportion to the population of the new town actually living within their boundaries. (Private sector housing in new towns is included in the relevant local authority figures and therefore does not have to be similarly treated.) The final variable is post war housing as a proportion of total housing stock; figures on dwellings, occupied and vacant, (housing stock) in the 1971 census included for the first time one room dwellings without a bath, that is bedsits. These are not included in the post war housing figures, and an adjustment should have been made for this. However, bedsits constitute such a small proportion of the total that the adjustment was not considered necessary.

Since employment and unemployment statistics and data on unfilled vacancies, obtained from the Department of Employment, are classified according to employment exchanges, it was necessary to devise a method of amending these to a local authority area basis. Taking the employment data (only), a matrix was constructed for each county with employment exchanges on the horizontal axis and local authorities on the vertical to provide factors by which the five employment variables could be converted to local authority basis. The local authority figures for insertion in the matrix cells were obtained from the economic activity tables of the population census after removing the self-employed, family workers and the armed forces which are not included in the employment exchange figures. Because the data to be amended were on an employment exchange basis, where the two sets of figures were not compatible it was the local authority figures that were changed. In some cases this was a large amendment but the only one possible to bring the two sets of data together. It is probable that the local authority data based on the census are the more accurate for the purposes of the present project and it would therefore have been better to have amended the employment exchange data but unfortunately the purpose of the matrix excluded this possibility.

Future work on the project is expected to fall into four main parts. These may be summarised as follows (for fuller discussion see (3)):

First, use of the data collected for a wide variety of purposes other than the social indicator work; for instance it is intended to use the measures of local well-being as independent factors in a study of inter-regional migration. Secondly, research into the basic issues of the project, which involves consideration of how indicator systems might be developed on a continuing basis

to meet the needs of policy makers. Thirdly, a review of existing literature on local social indicators in a number of countries and of the data needs and applications, especially within central government. And finally a possible extension of the work on social indicators to cover other parts of the EEC.

References
(1) 'Indicators of Local Prosperity in the South West Region'. I R Gordon and R M Whittaker. *Regional Studies. Vol. 6. 1972.*
(2) Local Indicators Project. Occasional paper by I R Gordon, Centre for Research in the Social Sciences, University of Kent at Canterbury.
(3) Indicators of Local Prosperity. S L Edwards and I R Gordon. EEC CREST Working Group. Research on Urban Planning.

APPENDIX

INDICATORS OF LOCAL PROSPERITY

Variables	Source
1. Income per head	To be derived using proxy variables
2. Average male earnings	,,
3. Average female unemployment rate	Department of Employment
4. Average male unemployment rate	Department of Employment
5. Average total unemployment rate	Department of Employment
6. Unfilled vacancies	Department of Employment
7. Index of unemployment seasonality	Derived from D E Statistics
8. Female activity rate	1971 Population Census
9. Proportion of professional and managerial workers	,,
10. Proportion of agricultural workers	,,
11. Proportion of unskilled workers	,,
12. Social Class }	,,
13. Social Class } Groups to be specified	,,
14. Social Class }	,,
15. Proportion of Children	,,
16. Proportion of young working age	,,
17. Proportion of old people	,,
18. Migration of young males	,,
19. Students over 16 in full time education by area of residence	,,
20. Proportion of adult population having professional or higher education qualifications	,,
21. Percentage of households owning two or more cars	,,
22. Percentage of households owning one car	,,
23. Telephone ownership	The Post Office
24. Index of industrial building	Department of Trade and Industry
25. Households with basic amenities	1971 Population Census
26. Incidence of overcrowding	,,
27. Sharing of dwellings	,,
28. Post War Housing	Department of Environment
29. Owner Occupation	1971 Population Census
30. Domestic Rateable Value	Department of Environment
31. Total Rateable Value	Department of Environment
32. Houses with very low rateable value	,,
33. Houses with high rateable value	,,
34. Number out of employment in census week, because they are (a) permanently sick (b) temporarily sick as a percentage of those in employment	1971 Population Census
35. Infant mortality	Registrar General
36. Death Rates	,,
37. Number of patients per doctor	Medical Practitioners Council
38. Accessibility to Services	R. D. P. Smith, Regional Studies 1968–1970
39. Number of Solicitors per 1000 population	Derived from Law Lists
40. Index of pollution	Dr Gilbert, Sheffield University
41. Percentage poll in local elections	Registrar General
42. Percentage poll in general elections	Command Paper on Electoral Expenses
43. Crime Rates	Home Office
44. Illegitimate births	Registrar General
45. Children in Care	Department of Health and Social Security
46. University Entrants	University Central Council on Admissions
47. Area	1971 Population Census
48. Population	,,

NOTE: There were no equivalent statistics for Scotland in the case of variables 32, 33 and 39. The source of data for Scotland for variables 37, 43 and 45 was the Scottish Home and Health Department, whilst the variable 38 was an unpublished paper by R D P Smith.

Box-Jenkins in Government: a development in official forecasting.

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Introduction

The Statistics and Operational Research Group of the Civil Service College provides post-experience training for large numbers of Civil Servants, be they administrators, scientists or specialist statisticians or economists. A subject which is currently arousing considerable interest in the Government Statistical Service is the Box-Jenkins technique of time series analysis and prediction; and, this article gives a non-technical account of the concepts underlying that approach.

The need for forecasting

In all fields of social and economic endeavour, good decisions will depend on good forecasts. The future is not completely unknowable, and it is generally accepted that forward planning must be based on information, where the area of uncertainty has been minimised. In consequence, considerable attention is paid to forecasting throughout government, and a premium is placed on predicting by the most appropriate and effective techniques. Departments have been generous in releasing officers for the purpose of finding out the facts about the art of forecasting.

The Civil Service College has, in the past, provided courses on population, educational and economic forecasting. The relatively recent research work of Box and Jenkins is now proving itself such an effective tool, for letting the data speak for themselves, that no provider of forecasts can afford to ignore it, and no policy maker should be ignorant of its power.

To meet the need, in the Civil Service, for information and experience of the Box-Jenkins approach to time series analysis and forecasting, the College has arranged a number of lectures and courses during the last twelve months. Thus on some recent Administration Trainee courses, and on some first and second level statistical courses for Principals, the basic ideas of the Box-Jenkins technique have been taught. More significantly, Professor Gwilym Jenkins has directed two intensive introductory workshops, for main grade statisticians at Sunningdale (January and September 1975), and run an advanced course at Lancaster (July 1975), for a small group of government statisticians, already experienced in the earlier published methods.

This article will be mainly concerned with the simplest applications of the Box-Jenkins approach, those of *univariate* time series analysis and forecasting. Here the object is to extract as much information as is possible from the past history of a time series, usually in order to try to forecast its future behaviour. There is little doubt that, for such 'autoprojection', Box-Jenkins is the most powerful technique available. Indeed, it is difficult to envisage how it can be much improved upon, except by making it rather easier to apply.

The univariate theory also provides a building block for all the more advanced methods in the Box-Jenkins repertoire; this article discusses it in detail and gives an indication of how it can be generalised to multivariate situations.

The nature of time series

A time series is a sequence of observations which are ordered in time. Generally one only considers discrete series, with observations made at equal intervals; the number of such observations being called the length of the series. Thus, the numbers of registered unemployed in the United Kingdom, on the second Monday of each month, from January 1970 to December 1974, would give a discrete series of length sixty. Evidently there are daily fluctuations in unemployment. But a month is a convenient sampling interval and little would be gained by recording more frequently, as consecutive weekly values, say, would provide very little extra useful information for the additional cost of collection. (Of course, if this were not so, one would hope that they would be recorded!) So a time series should be sampled sufficiently frequently to avoid losing worthwhile information, but not so frequently as to give a cluttered picture, mainly of irrelevant detail.

Series such as that of unemployment are called sampled series. Contrast them with those which have to be observed intermittently, for instance production figures. Such a series has no 'instantaneous' values, but refers to an accumulation over a period. Thus steel production,

recorded on the last day of the month, refers to production for the whole of that month, and not just for the last day.

In economics, these two types of series are referred to as 'stock' and 'flow' respectively. The various index numbers provide good examples of them. Thus, a Wholesale Price Index gives a sampled series, whilst an Index of Industrial Production gives an accumulated series.

Equal time intervals are postulated since, otherwise, the analysis becomes much more complicated. However, the calendar month is not of fixed length, ranging as it does between twenty-eight and thirty-one days; whilst the working month is even more variable, depending on the numbers of weekends, religious feasts and public holidays. (And what about strikes and working to rule?) For a sampled series, these irregularities are not so important; but, for an accumulated series, they have to be allowed for.

The fundamental time series property

Most statistical methodology is concerned with independent sets of observations. Lack of independence is typically considered highly undesirable – and one of the objects of good experimentation is to eliminate dependence. However, with time series analysis, we are concerned with data which develop through time; and where each observation may depend, to some extent, on earlier observations. It is, in fact, this dependence which is of interest, and importance.

Time series may thus possess a 'memory' of the past, in the sense that the latest value of a series reflects, to some extent, the previous values. Conversely, this memory immediately implies that the series possesses a certain degree of 'foresight', since past and present values will be expected to be reflected in the future.

For instance, if the appearance of a time series is very smooth, then a high current value, say, will imply that the next value will be high also. For it is reasonable to suppose that there is unlikely to be an immediate sudden kink in the series' profile, the smoothness being expected to persist, at least in the short term.

Of course, this prophetic property is based on the assumption that, if the observed pattern affords an adequate description of the past, it will also describe the future – which assumes a stability usually only encountered in the physical sciences. In the social sciences, other things remain equal only in the shortest term.

Purposes of analysis

Before we look at the Box-Jenkins methodology, consider why we want to analyse time series. Four reasons are:—

(a) Given an important historical series, it is natural to try to summarise its characteristics by a description of its statistical structure.
(b) From this description, we might well try to obtain information on how the series arose. Theoretical knowledge of the mechanism, which generated the series, is often hinted at by the observed structure.
(c) Either from its past structure, or from the insights obtained into its causal mechanism, we might then try to forecast future values of the series.
(d) It is quite likely that the forecast values are not to our liking, and we may try to take some control action to modify them.

Unfortunately, though the importance of the four aims tends to increase from (a) to (d), so does the difficulty of achieving them. Thus it is relatively easy to analyse a series, but more difficult to interpret the analysis in terms of a mechanistic explanation. To obtain good forecasts is considerably more difficult than to obtain a good fit to historical data, as, for the former, we must avoid latching onto spurious patterns in the past, which are purely fortuitous. In practice this means that, for successful analysis, a series has to be fairly long – of length at least thirty, say. Finally, the most difficult objective is effective control – one of the main purposes for analysing series in government. The trouble is that very little can be learnt from experience, because one cannot separate out whether a bad outcome observed occurred from poor forecasting and good control, or vice versa.

The Box-Jenkins method of analysing time series

The Box-Jenkins approach uses the fundamental time series property virtually to the full, by squeezing out the information contained in the observed associations between a value and previous values.

The objective of the analysis is to select an appropriate 'model' from a very versatile class of mathematical expressions, which may indicate the way values of the series are related to earlier values; and to suitably quantify the parameters in the chosen model, so as to reflect the strength of these relationships.

The sample statistics used for this are the calculated 'autocorrelations' between values at various distances of separation, which measure the corresponding associations. Thus, the association between adjacent values is measured by the first autocorrelation, and that between values, separated by a single observation, is measured by the second autocorrelation, and so on.

However, before investigating the autocorrelations, it is necessary, as with all statistical analyses, to undertake a thorough graphical study of the data. The series is first plotted and the analyst asks himself whether the plot appears stable, that is, whether the differences

between any two sections of the plot are due merely to chance or not. Model stability thus implies that the statistical structure of the series is independent of time. Should a series appear to be unstable, it needs to be suitably transformed to induce stability.

It so happens that, in practice, a search amongst two classes of transformation is usually sufficient to find one which gives stability. First, for a series which, say, exhibits either a continuous change in level, due to perhaps an upward trend, or haphazard jumps in level, it will be sufficient to work with the consecutive changes in the series values, rather than with the original series. The appropriate transformation is then to work with the series of 'first differences'. Higher-order differencing eliminates more complicated deterministic or stochastic instability.

Should the variability of the series plot be changing, an easy means exists to detect this, (when it is not obvious), and then to yield the appropriate transformation to induce stability. Thus, if the variability tends to be proportional to the local level, taking logarithms of the series will stabilise the data. Basically, the test is to divide the series into sections of equal length; and, for each of these sections, to calculate the mean (or arithmetic average) value and the range (the difference between the greatest and least values). The ranges are then plotted against the means, and a substantial departure from a horizontal plot indicates unstable variability. The characteristics of the departure then indicate what transformation to choose. For instance, a plot following an upward sloping straight line would indicate a logarithmic transformation.

Once a stable series has been obtained, the Box-Jenkins method can properly begin to be applied. This proceeds in a three-stage iterative cycle, followed by an important fourth stage.

First, the form of a possible explanatory model for the series must be identified. This form will then be tentatively entertained, and its particular parameters estimated. This now precisely defined model is next subjected to tests, to see whether it does give an adequate description of the series under study. These three stages of Identification, Estimation and Verification provide the basic Box-Jenkins cycle for time series analysis.

The identification is based on an appreciation of how the consecutive values of the series are associated. To a very large extent this is done by making inferences from the sequence of calculated autocorrelations. This is the stage which is generally considered to be the most difficult; but one of the strengths of the Box-Jenkins method is to allow for some shortcomings at this stage. A less skilled analyst will just have to go round the cycle rather more often.

Once the analyst has tentatively identified a model, the estimation is carried out automatically, in the most efficient way, by a computer program, and various quantities are also obtained, which enable the analyst to judge the adequacy of his estimated model. These quantities are designed not only to spot inadequacies but also to diagnose what is wrong with the model. They thus indicate how the model should be modified, and so enable an improved identification to be made. Thus, if a serious fault shows up at the verification stage, the analyst goes round the cycle again – and so on, until a satisfactory fit is obtained. The diagnostic statistics are mainly based on the 'residuals', the discrepancies between the actually observed series values and those corresponding values given by the fitted model.

Then comes the fourth stage. The analyst must satisfy himself, and more importantly the policy maker, that the fit achieved does in fact make sense. Otherwise he may well have further to modify his identification and refit the series.

Note, that the object of the analysis is not to obtain the best possible fit to the historical series. A sufficiently cumbrous model can always be postulated, which will exactly explain any series of finite length. That this is pointless is clear, since we know that for any series, whose behaviour is not precisely determined, there must be some degree of statistical uncertainty. A model, which says that the data are completely explained by the data, makes a valid, but useless, claim.

The object is to pick out the real patterns, as opposed to those patterns which are purely fortuitous. The way this is achieved by Box and Jenkins is to strive always for the simplest model compatible with the data. This principle of 'parsimony' is very important at the identification stage, where the first time round, the aim should be to just explain the most outstanding characteristics of the series. With them out of the way, the diagnostics will indicate what remains to be accounted for.

Due to this iterative nature of Box-Jenkins modelling, it is highly desirable that the analyst has on-line access to a computer.

Comparison with econometric modelling

The Box-Jenkins approach to time series modelling is radically different to econometric methods. In the latter, the form of the underlying relationship is decided from considerations based on economic theory, often nebulous, and past data are used just to fit the relationship. To the open-minded this can only appear unnecessarily restrictive.

The Box-Jenkins approach deals initially just with the data, and thus is far less inhibited. When a fit is achieved, this is scrutinised to see that it does make

theoretical sense. But the approach does not prejudge the issue. Thus a Box-Jenkins analysis and forecast is not limited to preconceptions, which so often are misconceptions. However, this freedom does require a certain degree of maturity and experience on the part of the analyst. As with most skills, the approach, in practice, is only as good as the practitioner.

The following highly simplified example provides a comparison between the two methods.

An economist reckons that, after seasonal adjustment, a sound theoretical model for unemployment is as follows:—

the current month's number of unemployed is equal to

a fixed proportion of the previous month's number (those unemployed who have not found a job)

plus

the freshly unemployed.

He thus has to estimate what this proportion is and also the variability of the 'freshly unemployed'. These estimates will be obtained using the past data.

The Box-Jenkins analyst will initially just look at the unemployment series to date and fit the best parsimonious model, which the data suggest. He may come up with the same fit as the economist, in which case the latter will happily explain it for him. However, the data may indicate that the level of unemployment depends, also, on what the level was *two* months previously. This can be equally well explained by economic theory, but was ruled out by the economist for reasons which, to the impartial onlooker, might well appear arbitrary.

Another point about the Box-Jenkins approach is that it easily copes with seasonality, so it is not necessary to first deseasonalise the data, as is normal practice in econometric modelling. For instance, without seasonal adjustment, the level of unemployment might be expected also to depend on the level twelve months previously. Such associations, if real, will be reflected in the sequence of autocorrelations, and spotted by the Box-Jenkins analysis.

This capability of dealing with the unadjusted data is clearly a considerable advantage, as, apart from being a highly complex skill, the success of deseasonalisation is often open to question. Moreover, when the interrelationships of several series are being investigated, one evidently risks throwing away valuable information, by working with deseasonalised series.

The proof of the pudding

No matter how one forms a fit to a time series, for forecasting one tacitly assumes

(a) the fit is approximately of the right form

(b) the estimated fit is close to what it should be

(c) the fit can be safely extrapolated

(d) the situation does not change during the lead into the future, for which the forecasts are made.

(Note that (c) and (d) are not quite the same thing. As an analogy, consider heating a kettle. We might observe that, without altering the heat supply, the water increases in temperature fairly steadily up to, say, 90°C. But this steady increase can only be safely extrapolated up to 100°C when the water begins to boil away at a constant temperature. However, if one changed the situation, by turning off the gas when 90°C was attained, even the extrapolation to 100°C would be quite incorrect.)

The acceptability of (a) and (b) can be adequately tested, for instance at the verification stage, when using the Box-Jenkins method. But (c) is an act of faith – perhaps justified. (d) is an act of faith, which, in the social sciences, can only be justified in the very short run.

However, if we make these assumptions, under the conventional 'least squares' criterion, for forecast errors, the Box-Jenkins fit immediately yields optimal forecasts. At the same time, likely limits for the amount by which the forecasts will be found to be in error, when the future values are eventually observed, can be obtained. Even for univariate models, these 'tolerances' are often found to be smaller than those obtained from far more costly econometric forecasting. Moreover, the actual discrepancies eventually observed, which are of course what really matter, still tend to be lower.

When the approach is extended, by using information from some appropriate concomitant series, the improvement over econometric modelling is more marked. And, using the full power of the generalised multivariate input-output Box-Jenkins approach, the advantages are likely to be considerably greater. The beauty of the advanced approach is that only those series, which really do contain extra relevant information, find their way into the finally modelled system. Again the principle is to let the data have their say. Promising-looking series can be thrown into the pot; but, if they do not add anything, they will be discarded. A good example of this is the refutation of the traditional view that past values of the Wholesale Price Index are useful for predicting future Average Earnings. This is found to be little more than folk-lore. Virtually all the relevant information is already contained in the past values of Average Earnings.

Another important Box-Jenkins procedure, 'intervention analysis', allows one to estimate how policy decisions, of a type encountered in the past, are likely to affect future values of a series. This possibility largely silences those critics, who suggest that Box-Jenkins is just a highly effective extrapolatory technique, which is completely useless when the situation changes – as, indeed, it eventually must.

Evidently, in the current highly volatile economic and political climate, all forecasts can, and almost certainly will, drift off course. However the adaptive nature of Box-Jenkins forecasts, due to their updating mechanism, enables the forecast function swiftly to latch onto new trends.

An example of Box-Jenkins forecasting

The following is an example of a univariate Box-Jenkins forecast in government. The Food Economics Unit of the Ministry of Agriculture, Fisheries and Food wished to forecast the 'index of production for spirits', shown in Figure 1, for leads up to two years. Econometric forecasting had already been tried, but had been found to be unsatisfactory.*

Figure 2 shows the forecasts made from the base of June 1974, together with bounds only likely to be violated with a 1 in 20 chance. Figure 3 compares the forecasts with the actual values, which have become available since the forecasts were made; whilst figure 4 shows the updated forecasts made with the aid of this more recent information.

The series in figure 1 has some conspicuous features, notably a strongly rising trend and clearly marked seasonal pattern. These features are represented in the fitted model, and can be seen in the forecasts shown in figure 2. Figures 3 and 4 demonstrate how the forecasts adapt to changing circumstances; from the beginning of 1975, the actuals lie systematically below the forecasts, and this fact is recognised in the lower and less steeply rising updated forecasts.

*I am grateful to Mr K. G. Foote of MAFF for these data.

Figure 1

Monthly index of production for spirits

Seasonally unadjusted, 1970=100 January 1968 to June 1974

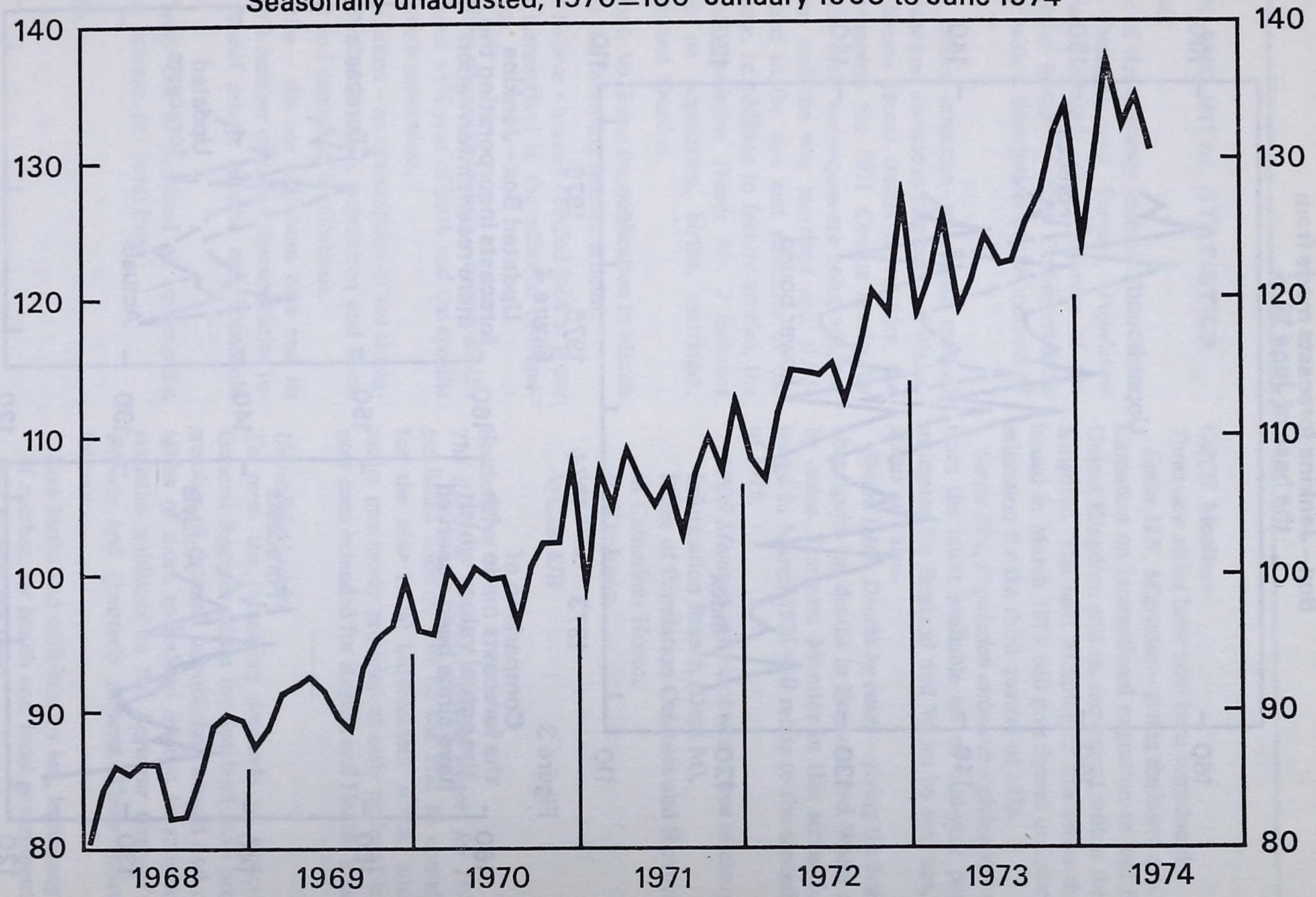


Figure 2

Box – Jenkins forecasts made from the base of June 1974

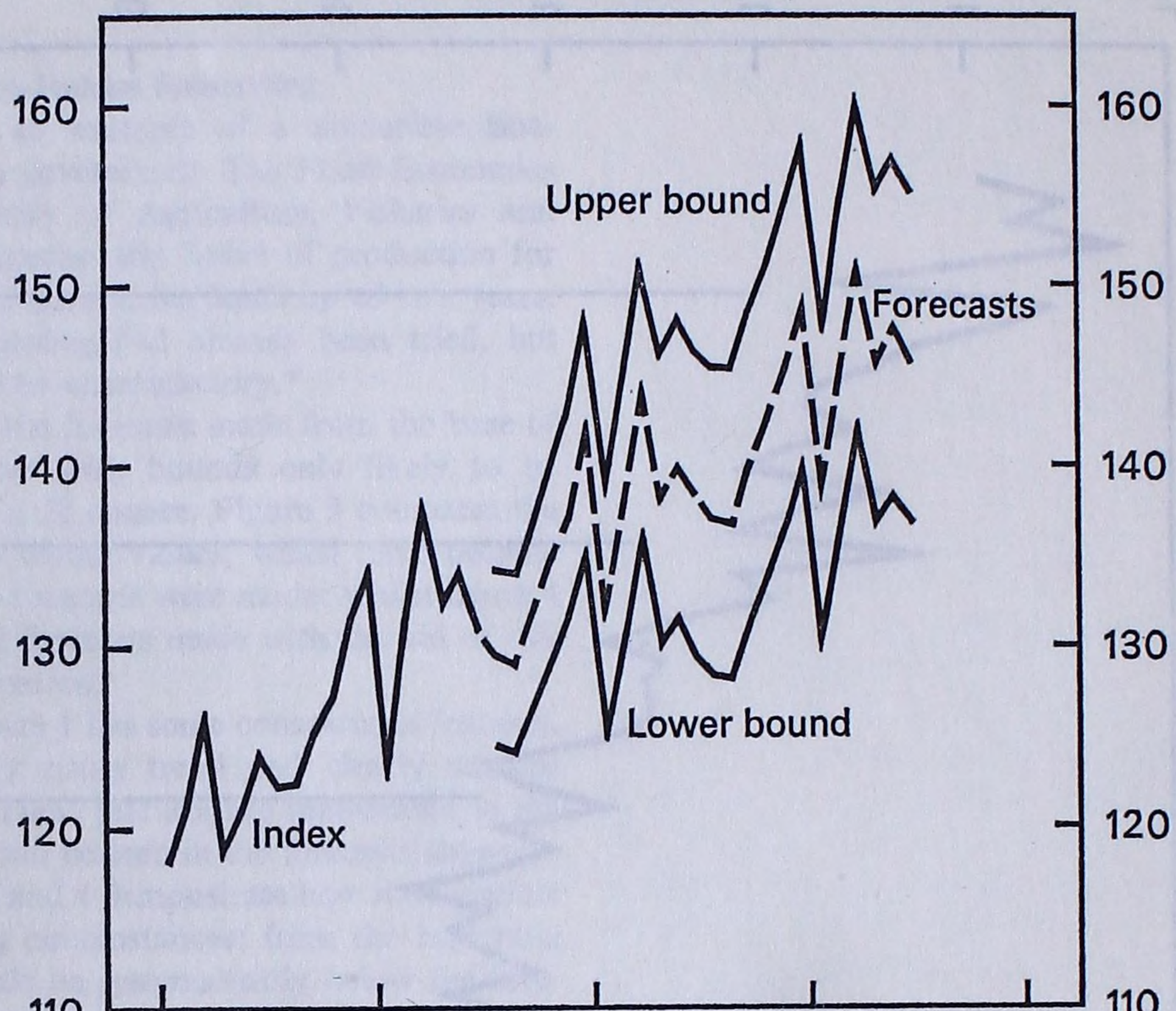


Figure 3

Comparison of the forecasts made with the actual values which have since been observed

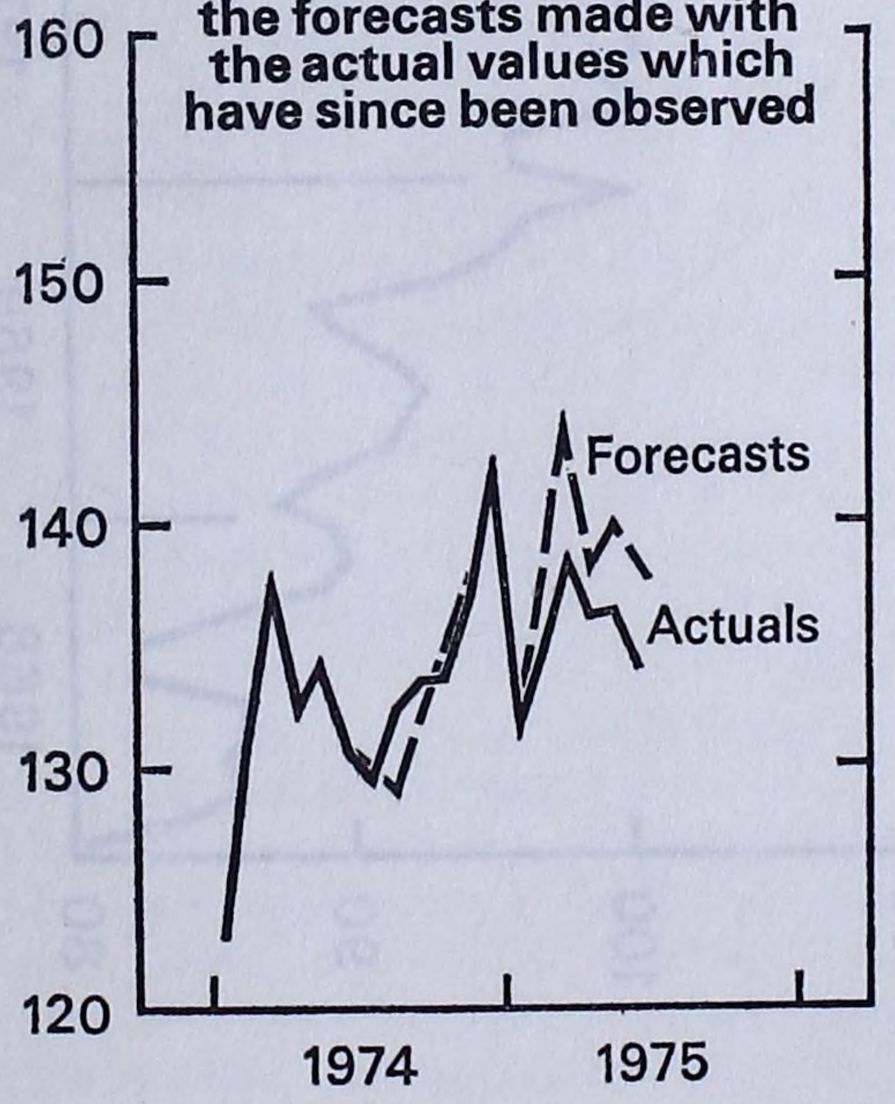
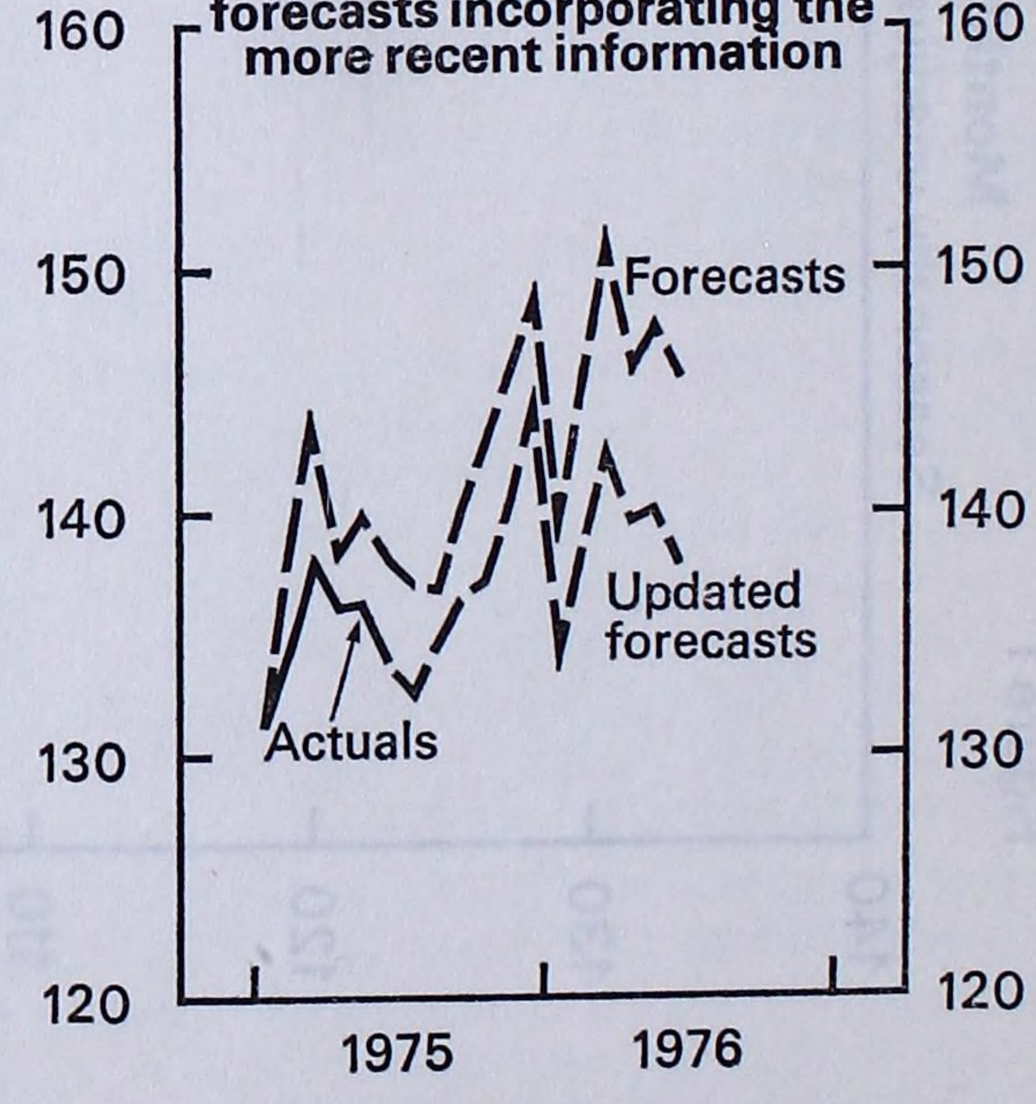


Figure 4

Updated Box – Jenkins forecasts incorporating the more recent information



Notes on current developments

POPULATION AND VITAL STATISTICS

Population Trends

The second issue of the quarterly journal of the Office of Population Censuses and Surveys, *Population Trends 2* contains the latest official estimate of the population in Great Britain of New Commonwealth descent, together with a description of the method of calculation.

The editorial draws attention to recent marked changes in marriage and divorce in England and Wales. Other articles discuss recent trends in suicides, the advantages of mapping the 1971 Census results by computer, how life table techniques are being adapted to new situations and the way marriage and child-bearing are related to the size and structure of the female labour force. In addition to feature articles, the regular tables of *Population Trends No. 2* includes quarterly figures on population, births, marriages, deaths, migration and abortion.

Population Trends No. 3 due for publication in March 1976 will include the following feature articles:

Marriage and divorce – a more detailed look at some of the trends summarised in the editorial of *Population Trends No. 2.*

Cancer mortality: generation effects – cancer deaths may be associated with year of birth and the specific experience of each generation.

Ageing of population – an examination of the changing age structure of Britain's population and some possible social and economic implications.

Leisure activities – the use of leisure time and its relationship to a number of social characteristics including age, social group, income and household composition.

Population Trends can be obtained on subscription (£8·44, including postage, per year) from

HMSO,
PO Box 569,
London,
SE1 9NH.

References

Population Trends 2 (HMSO) December 1975 £2 net.

Population Trends 3 (HMSO) due in March 1976 £2 net.

OPCS Monitors

Three new series have now been introduced.

Series MN, Migration – giving the latest available information on international migration to and from the United Kingdom and on movement within the United Kingdom. The next Monitor in this series due to be issued in March 1976 will give figures on international migration for the third quarter of 1975.

Series PP1, Population estimates – giving key statistics from the latest available set of mid-year population estimates for England and Wales by sex, age, marital status and area.

Series DH2, Deaths by cause – giving the latest available figures on deaths in England and Wales analysed by cause. The next Monitor in this series due to be issued in March 1976 will relate to the second quarter of 1975.

OPCS Monitors can be obtained free of charge from:

Information Branch (Dept M),
Office of Population Censuses and Surveys,
St Catherines House,
10 Kingsway,
London,
WC2B 6JB

Scotland

The Registrar General's Annual Report for 1974, to be published shortly, will be the first to contain tables for the new Local Government Areas, and several tables previously provided at only national level have now been extended for Region and Health Board areas.

Unpublished tables

To meet the increasing demands of customers the General Register Office for Scotland have produced a number of detailed unpublished annual and quarterly tables of more specialised interest to supplement the statistics published in the *Registrar General's Annual Reports* and *Quarterly Returns*. These tables are as follows:—

Live births and stillbirths by sex, legitimacy and age of mother, by health and local government district, 1974 (1 page per area)

Multiple births (live and still) by legitimacy and age of mother, by health and local government district, 1974 (1 page per area)

Stillbirths, by sex, cause ('P' list ICD codes) and age of mother, by health and local government district, 1974 (6 pages per area)
Stillbirths, by sex, cause ('P' list ICD codes) and age of father, by health and local government district, 1974 (6 pages per area)
Deaths by sex, age and cause (detailed list ICD codes), by health and local government district, 1974 (5–15 pages per area)
Deaths by sex, age and cause (4th digit ICD codes), Scotland, 1974
Deaths by sex, age and marital status, by health and local government district, 1974 (3 pages per area)
Infant deaths, by sex, age and cause ('P' list ICD codes), by health and local government district, 1974 (3 pages per area)
Divorces, nullities and dissolutions of marriage, by sex and age at divorce, Scotland, 1974.

Certain further quarterly data are also available from and including 3rd Quarter 1974 as follows:—

Live births by sex, by local government district, by quarter (1 page per area)
Deaths by sex and age, by local government district, by quarter (8 pages per area)
Deaths by sex, age and marital status, Scotland, by quarter
Surviving widows and widowers by age, Scotland, by quarter.

In addition to the tabulations outlined above, there is also available unpublished population projection material relating to single projection years and single years of age, down to health and local government district level extending to 1991.

Copies of these tables, or part tables, can be supplied at copying cost. All enquiries should be to:

The General Register Office for Scotland,
Medical & Vital Statistics Section,
Statistics General Branch,
New Register House,
Edinburgh,
EH1 3YT,
(Tel. 031–556 3952).

Census reports

The following census reports have been published since the list given in *Statistical News No. 31.*

Topic	Publication date	Price
County Economic Activity (four regional volumes)		
Highlands & North East	December 75	£3·00
Tayside and Edinburgh	,,	£3·40
Glasgow and Falkirk/Stirling	,,	£5·00
Borders and South West	December 75	£2·30
Index of Scottish Place Names	,,	£4·65
Workplace and Transport	January 76	£3·60

HEALTH AND SOCIAL SECURITY

Mental illness and mental handicap statistics

A new report, published in January 1976 gives further information on the changing mental health services provided by mental illness and mental handicap hospitals and units in England and Wales. The report, number 11 in the Department's Statistical and Research Report Series contains statistics on the facilities and services in individual hospitals and units for the mentally ill and the mentally handicapped in 1973. National statistics are also given as well as information for the Regional Hospital Boards operating in 1973 and the new Regional Health Authorities established in April 1974.

The report shows that for mental illness hospitals and units, the number of in-patients per thousand population resident at the end of 1973 was 5 per cent lower than in 1972 and 28 per cent lower than in 1964. Following a period of growth from 1964 to 1970 and little change thereafter admission rates fell slightly in 1973. The trend towards more intensive care has continued with patient turnover per bed increasing by 4 per cent over 1972 to a level 50 per cent higher than in 1964. Day patient and out-patient services for the mentally ill increased and there have been continuing improvements in staffing levels.

In mental handicap hospitals and units, the number of patients resident per thousand population decreased in 1973 to reach a level 7 per cent below the 1970 figure and the admission rate fell slightly compared with 1972, although it was still 8 per cent higher than in 1970. Day patient attendances increased in 1973 but out-patient attendances fell slightly.

Information given for individual hospitals shows the wide differences in services in different parts of England and Wales and the improvements made in recent years. For example, in 1966, forty of the large mental illness hospitals had less than three psychiatric medical staff per 100,000 catchment population but in 1973 only five hospitals were in this category. The report also lists those hospitals which by 1973 had not achieved certain minimum standards for staff or amenities set by the Department.

Reference

Statistical and Research Report Series No. 11. *The Facilities and Services of Mental Illness and Mental Handicap Hospitals in England and Wales 1973* (HMSO) January 1976 (Price £2·95 net).

Social Security Statistics 1974

Social Security Statistics 1974, the third in a series of annual publications, has been published by HMSO for the Department of Health and Social Security. As in the previous publications the 1974 edition contains a selection of leading statistical tables covering each of the Social Security cash benefits paid by the Department of Health and Social Security and unemployment benefit paid by the Department of Employment. There are also tables about national insurance contributions and social security finances. Trends over several years are shown and more detailed analyses are provided for the most recent year available. Most of the statistics relate to Great Britain but summary tables for the United Kingdom are also included. In some tables statistics are given for Great Britain as a whole and in others separate figures are given for the English Regions and Wales and Scotland. The regional analyses are based either on the Social Security Administrative Regions or on Standard Regions. Copies may be purchased from HMSO book shops or through booksellers.

Reference
Social Security Statistics 1974 (HMSO) (Price £5·10 net).

Social work statistics for Scotland

On 31 March 1976 the Social Work Services Group of the Scottish Education Department will introduce a new system for the collection of statistical information about social work services in Scotland. The system follows the recommendations of a Committee of the Advisory Council on Social Work, chaired by Professor F. M. Martin of Glasgow University, which recently completed a thorough review of the whole field of social work statistics.

The new system involves the introduction of unit returns for social work cases, together with individual returns for certain categories of children (mainly children in the care of the local authority and children placed on supervision by a children's hearing), and for the professional staff of social work departments and of voluntary organisations in the social work field. Revised returns are also to be introduced for residential and day care establishments, and for home care services. An amended return has been used since 16 May 1975 by the reporters to the children's panels.

On its establishment in December 1972 the Martin Committee was given the following remit:—

'To review the statistical information about social work services which is provided to the Secretary of State by local authorities and voluntary bodies and to consider the method of recording and collecting this information'.

Members of the Committee and of its several working groups included three directors of social work, a town chamberlain, the reporter to a children's panel, representatives of the British Association of Social Workers and of the voluntary organisations working in the social work field, and a senior lecturer at the National Institute of Social Work.

An important element of the new system is that an Advisory Committee on Social Work Statistics will be set up to keep the system under continuing review. The membership of the Advisory Committee will be broadly similar, in its coverage of the main interests in social work in Scotland, to the original Martin Committee.

Further particulars and copies of the Final Report of the Martin Committee may be obtained from:—

Mr D F Goda,
Social Work Services Group,
St Andrew's House,
Edinburgh,
EH1 3DB.
(Telephone No: 031–556 8501, Extension 2057).

SOCIAL STATISTICS

Amendments to Social Trends No. 6

Social Trends No. 6 1975 was published by HMSO on 11 December 1975. Unfortunately some errors have crept into the published version; these are listed below.

Page 15, last paragraph
The data in the commentary need be slightly amended in keeping with the data in the revised Table 2.6 set out below.

Page 16, Table 2.6
Delete table and substitute the revised table overleaf.

Page 26, Table 7.3
Columns 1 and 2 refer to the social class of the father, or mother if the baby is illegitimate; column 3 refers to that of the mother.

Table 2.6 Families (1) by size and Social Class of head, 1971

Great Britain — Percentages

	Persons in families				Total families (=100%) (thousands)	Total persons (thousands)	Persons per family
	2	3	4	5 and over			
Social Class of head:							
I	34	22	28	17	677	2,259	3·34
II	39	23	24	14	2,585	8,279	3·20
III N	46	24	20	11	1,566	4,712	3·01
III M	37	24	23	17	4,983	16,661	3·34
IV	42	23	19	16	2,373	7,609	3·21
V	44	22	16	18	966	3,152	3·26
Not classified	58	20	12	11	1,368	1,931	2·84
All families	41	23	21	15	14,518	46,558	3·21

(1) Excluding 1-person households.

Source: Census of Population, 1971
Classification: Social Class of head of household.

Pages 36 and 37, Figures I and III
The charts of Figures I and III are transposed
Page 58, Table 1.17
The line 'outflow' column 1973–74
delete 225, substitute 255.
Page 87, Table 3.15
The line 'United Kingdom', column '1970/71'
delete 17.7, substitute 16.4.
Page 206, Table 13.21
The two lines under 'Tax relief on mortgages' for 'mortgagors' read 'mortgagees'.
Page 212, Table 14.7
The line 'United Kingdom', column '1973' insert 17.2.
Page 216, Chart 14.16
The key at foot of chart, transpose 1962–1968 and 1962–1974.

Any queries should be referred to Chris Lewis (01–233–8201) or Ron Freeman (01–233–7637) in the Central Statistical Office, Great George Street, London SW1P 3AQ.

Homicide statistics

This report traces homicides which are originally so classified by the police, through to the point where, after court proceedings, they can be grouped into 'normal' murder; suicide-murder; section 2 manslaughter; common law manslaughter reduced from murder; other common law manslaughter, and infanticide. Mrs Gibson's analysis covers victims, suspects and methods used in the killing, and gives details of the sentences imposed.

Reference

Home Office Research Studies No. 31. *Homicide in England and Wales 1967–1971* by Evelyn Gibson. (HMSO 1975) (Price 90p net).

LIBRARY STATISTICS

First employment of library school students

Postal surveys of students leaving library schools in the United Kingdom were started by the Department of Education and Science in 1969. Information on these surveys has been published in papers in the *Library Association Record*. The latest survey covered 1395 full-time students who left library schools in 1973/74. Information was obtained from 82 per cent of the students on their educational and library background and first professional employment. 80 per cent of students had taken either a two year course leading to the Associateship of the Library Association or a one year post-graduate course. Nearly 90 per cent of the students responding obtained professional work in librarianship or information science; the public library service continued to be the main destination, gaining in popularity with first degree students and post-graduates. Those who had not obtained employment were generally applying some geographical limitation to their search. A serial study covering 1969 to 1974 has been published in the December 1975 issue of the *Library Association Record* obtainable from

The Editor,
Library Association Record,
7 Ridgemont Street,
London,
WC1E 7AE.

Statistics of libraries in major establishments of further education

The Department of Education and Science in collaboration with the Scottish Education Department, the Northern Ireland Department of Education and the Welsh Office has carried out a survey covering the

academic year 1973/74 of library facilities in major establishments of further education.

Topics covered include the number of service points and their area; number of study places; book stock, plus non-book materials; annual additions to book stock and inter-library loans. Expenditure, numbers of library staff and students and academic staff served were also recorded. 695 colleges were circularised via local authorities and 661 responded (100 per cent response from Scotland and Northern Ireland and over 94 per cent for England and Wales). A report is available giving results of the survey at individual college level apart from 57 colleges who did not give their consent for their individual results to be published, although they are included in the summary tables. About half the colleges not giving consent indicated that they considered their information for 1973/74 was atypical in some way e.g. rebuilding or amalgamation. Copies of the report and further information can be obtained from

Mrs S Keith,
Statistics Branch,
Department of Education and Science,
Elizabeth House,
York Road,
London,
SE1 7PH.

Prior to this study, the Library Association undertook similar exercises, producing data in much the same format for 1971/72 and 1972/73.

HOUSEHOLD INCOME, EXPENDITURE AND PRICES

An income surrogate for small areas (wards)

The Department of Environment has commissioned a research project designed to try out and test a method of estimating average household incomes for wards and parishes. Data from the 1972 General Household Survey (GHS) are being used, within the Office of Population Censuses and Surveys, to develop the equations. If the project is successful it will be possible to estimate average household incomes from the 1971 Census Small Area Statistics.

The project has four stages:

(i) The GHS 1972 figures will be compared with Kemsley's work on the Family Expenditure Survey (1970) to check the distribution of income by socio-economic group in the GHS.

(ii) A sub-sample of three thousand individuals will be selected at random from the GHS and an equation relating an individual's income to other personal characteristics will be established using multiple classification analysis. The independent variables used will be the following:

Socio-economic groups
Age
Higher educational qualifications
Sex
Region
Area type
Number of hours a week worked by women
Industry.

(iii) A fresh sample of two thousand households will then be chosen and, for each individual in the sample, an estimate of income will be made using the equation obtained in section (ii). The incomes will then be summed to give an estimate of the corresponding household income. This estimate will be compared with the household's actual income and, if it is not sufficiently close, a new multiple classification analysis will be conducted and the equation relating individual and household income adjusted. The independent variables used this time will be:

Socio-economic group of head of household
Tenure
Amenities in the home
Possession of one or more than one cars
Whether or not there is more than one household at the address
Number of rooms in the dwelling
Size of household
Density of occupation (persons per room).

If estimated household income is then sufficiently close to actual household income the project will proceed to a fourth stage.

(iv) One hundred wards in the GHS sample will then be selected at random and the income for each household in the sample will be estimated using the equations derived in (ii) and (iii). The difference between the actual income and the estimated income of each household will be calculated. An analysis of variance within and between the wards will be conducted on these differences. This will then be used to derive an approximate measure of the confidence limits within which the average income per household can be estimated for an individual ward.

It is hoped to publish the results during 1976 as one of the series of the Department of the Environment research reports.

Retail Prices Index

A recent article in the *Department of Employment Gazette* described the method of construction of the Retail Prices Index in non-technical language. The

object was to explain to general non-specialist readers the purpose of the index, what it measures, how it is compiled and some ways in which it may be used.

Reference
Department of Employment Gazette October 1975 pages 971–978 (HMSO) (price 90p net).

MANPOWER AND EARNINGS

Vacancy statistics

As a consequence of the Sex Discrimination Act, 1975, it is generally no longer possible for employers to notify employment offices or careers offices of vacancies for workers of a specific sex. After December 1975, the Department of Employment thus cannot continue to compile statistics of notified vacancies separately for males and females. Monthly statistics of total vacancies remaining unfilled on specific dates will continue to be published.

National and regional labour force projections: 1976-1991

Revised national and regional projections of the labour force up to 1991 have been published by the Department of Employment. The national projections replace those published in April 1974 (see *Statistical News* 26.15): they are derived from 1973-based projections of the total population, using methods similar to those used previously. The regional projections replace those to 1986 published in March 1972 (see *Statistical News* 17.24) and are derived from projections of the regional home populations, published by the Office of Population Censuses and Surveys. The ratio of the activity rate for each Standard Region to the national rate was extrapolated to 1991, so that regional activity rates up to that date could be derived from the corresponding national activity rates used in the national projections.

Reference
Department of Employment Gazette, December 1975 (HMSO) (Price 90p net).

The changing structure of the labour force

The Unit for Manpower Studies in the Department of Employment has recently completed an examination of the changing structure of the labour force. The study was concerned with long-term changes in terms of age, sex, occupation and industry; it looked at self-employment and at part-time working and examined the available data on labour mobility. Likely future changes were also considered, using projections of the labour force and of occupational and industrial distributions.

A summary report entitled *The changing structure of the labour force* is available from the:

Unit for Manpower Studies,
Department of Employment,
Steel House,
11 Tothill Street,
London SW1.

Articles on manpower planning

Further articles of interest to manpower planners have been published in recent issues of the *Department of Employment Gazette* (see *Statistical News* 31.33 etc). The October 1975 issue contained an article on the career patterns and training needs of engineers, scientists and technologists in the chemical and allied industries and a short summary of the published report on the Changing structure of the labour force (see above). An article on recent trends in apprenticeship training and a description of the latest information on labour mobility between employers, occupations, industries and regions were published in the November and December issues respectively.

Off-prints of these and other articles in this series can be obtained from the:

Unit for Manpower Studies,
Department of Employment,
Steel House,
11 Tothill Street,
London SW1.

Reference
Department of Employment Gazette, October, November and December 1975 (HMSO) (Price 90p net).

Changing patterns of working hours

Differences in patterns of working hours in Britain are increasing. Some variations on the fixed (for example 9 am to 5 pm) working day, such as overtime, shift work and part-time work, for example, are already well established. Three important innovations, namely flexible working hours, compressed work week and staggered hours are described in *Changing Patterns of Working Hours*, a report on a study undertaken by Dr P J Sloane whilst on secondment to the Department of Employment's Unit for Manpower Studies.

By the beginning of 1974, some five hundred British organisations with about ten thousand employees were thought to have flexible hours schemes, over one hundred thousand night-shift engineering workers on a compressed week of four or four and a half working days, and around one thousand single-shift employees on a four-day week. Staggered working hours have also been introduced in one or two selected areas.

The report is based mainly on case study investigations of individual organisations. Twelve using flexible working hours were studied, eight where the compressed work week had been adopted, and one operating a system of internal staggered hours. The main sources of information were interviews, surveys and, where available, documentation and statistical data.

Reference
Department of Employment: Manpower Paper No. 13 *Changing Patterns of Working Hours* by Dr P J Sloane (HMSO), November 1975 (Price 80p net).

Index of average earnings

The coverage of the monthly index of average earnings of employees in Great Britain, compiled by the Department of Employment, is being extended to the whole economy from the beginning of 1976. The present index, introduced in 1963, covers all production industries, including agriculture, but relatively few service industries. In addition to the principal index, there are separate indices for each industry group (Orders of the Standard Industrial Classification) covered and for all manufacturing industries combined. The main sectors not covered hitherto are public administration, distributive trades, professional and scientific services and insurance, banking, finance and business services.

Arrangements have been made to collect the requisite information, on a sample basis, from organisations, authorities, institutions and companies in these sectors. It will thus be possible to publish indices for the whole economy and for every industry group (SIC Orders), based on January 1976=100.

There are seasonal variations in average earnings and the seasonal pattern varies between industries. It will however be several years before the new series for the whole economy can be adjusted for normal seasonal variations. The present principal index and the corresponding seasonally adjusted series will therefore continue to be published for an indefinite period. The present separate industry series are also continuing because they are used extensively as the basis for variation of price clauses in long-term contracts and similar purposes.

New Earnings Survey 1976

The arrangements for the New Earnings Survey 1976 are much simpler than last year, when there were complications arising from EEC requirements. There are no questions on special topics (such as holidays with pay), and so the survey questionnaire is shorter than usual. Information is being obtained from employers on the earnings and hours of one per cent of employees for one pay-period in April.

Index of average salaries

The index of average salaries compiled by the Department of Employment on the basis of New Earnings Survey data for April from 1970 onwards has been revised and limited to full-time non-manual adult employees. From 1975, the survey coverage of other non-manual employees is incomplete.

Reference
Department of Employment Gazette, January 1976 (HMSO) (Price 90p net).

Average salaries in production industries

The Department of Employment has introduced a new series of estimates of average earnings of full-time non-manual employees in index of production industries in the United Kingdom. The estimates relate to October in each year. Those for 1973 are based on information obtained in the survey of labour costs in 1973; those for 1974 and subsequent years are based on a new series of annual surveys (*Statistical News* 29.26). The estimates for 1973 and 1974 were published in the December 1975 issue of the *Department of Employment Gazette*.

Reference
Department of Employment Gazette December 1975 (HMSO) (Price 90p net).

INDUSTRIAL STATISTICS

Business Monitors – Annual Census of Production 1972

As the Business Monitors reporting the results of the 1972 Census of Production become available, they will be brought to the attention of readers in *Statistical News*. A list of the first of these Monitors to be published appeared in Issue No. 30 and a further list appeared in Issue No. 31. Those published since then are listed below. They can be obtained on standing order from:

Her Majesty's Stationery Office,
P.O. Box 569,
London,
SE1 9NH,
(Telephone 01–928–6977)

although they are not included in the global subscription arrangements for the Business Monitor series. They are also available through Government Bookshops or through booksellers.

Business Monitor Number	*Description*	*Standard Industrial Classification Minimum List Heading*
PA 102	Stone and slate quarrying and mining	102
PA 214	Bacon curing, meat and fish products	214
PA 215	Milk and milk products	215
PA 218	Fruit and vegetable products	218
PA 221	Vegetable and animal oils and fats	221
PA 229·2	Starch and miscellaneous foods	229/2
PA 231	Brewing and malting	231
PA 239·2	British wines, cider and perry	239/2
PA 271·2	Organic chemicals	271/2
PA 272	Pharmaceutical chemicals and preparations	272
PA 273	Toilet preparations	273
PA 279·3	Explosives and fireworks	279/3
PA 279·4	Formulated pesticides, etc.	279/4
PA 279·5	Printing ink	279/5
PA 279·6	Surgical bandages, etc.	279/6
PA 311	Iron and steel (general)	311
PA 323	Miscellaneous base metals	323
PA 332	Metal-working machine tools	332
PA 335	Textile machinery and accessories	335
PA 363	Telegraph and telephone apparatus and equipment	363
PA 364	Radio and electronic components	364
PA 366	Electronic computers	366
PA 384	Locomotives, railway track equipment, railway carriages, wagons and trams	384, 385
PA 396	Jewellery and precious metals	396
PA 399·8	Miscellaneous metal manufacture	399/2,3, 4 and 8,9,10, 11,12
PA 413	Weaving of cotton, linen and man-made fibres	413
PA 423	Textile finishing	423
PA 429·1	Asbestos	429/1
PA 433	Fur	433
PA 443	Women's and girls' tailored outer-wear	443
PA 444	Overalls and men's shirts, underwear, etc.	444
PA 445	Dresses, lingerie, infants' wear, etc.	445
PA 446	Hats, caps and millinery	446
PA 464	Cement	464
PA 469·2	Miscellaneous building materials and mineral products	469/2
PA 474	Shop and office fittings	474
PA 484·1	Wallcovering	484/1
PA 485	Printing and publishing of newspapers and periodicals	485, 486
PA 489	General printing, publishing, etc.	489
PA 491	Rubber	491
PA 492	Linoleum, plastics floor-covering, leather-cloth, etc.	492
PA 494·1	Toys, games and children's carriages	494/1 and 2
PA 496	Plastics products	496
PA 499·1	Musical instruments	499/1
PA 499·2	Miscellaneous manufacturing industries	499/2
PA 603	Water supply	603

Further information on these Business Monitors and on the Census generally can be obtained from:

Mr R J Egerton,
Business Statistics Office,
Cardiff Road,
Newport,
Gwent,
Newport 5611 (STD code 0633) Ext. 2455.

Quarterly production series

Since the last issue of *Statistical News*, one new Business Monitor has been issued in the Quarterly production series. Its reference number and title is:

PQ 218 Fruit and vegetable products

PQ 333, which appeared as 'Pumps, valves, compressors and fluid-power equipment', now appears as three separate publications. Their reference numbers and titles are:

PQ 333.1 Pumps
PQ 333.2 Valves
PQ 333.3 Compressors and fluid power equipment

The Quarterly production series of Business Monitors are available on subscription from:

Her Majesty's Stationery Office,
PO Box 569,
London,
SE1 9NH,

at 74p per annum for each title. Individual copies may be purchased over the counter at either the Department of Industry's Central Library, 1 Victoria Street, London SW1H 0ET, or at the Department's Statistics and Market Intelligence Library, Export House, 50 Ludgate Hill, London EC4, or can be ordered by post (payable in advance: prices will be supplied on request) from:

The Librarian,
Business Statistics Office,
Cardiff Road,
Newport,
Gwent NPT 1XG.
Tel: Newport (0633) 56111 Ext. 2399.

Service and distributive series

Since the last issue of *Statistical News*, six new Business Monitors have been added to those available in the Service and Distributive Series. All are parts of the Report on the Census of Distribution and other Services 1971. Their reference numbers and titles are:

SD 13 Part 4. North Region. (Price £1·50)
SD 14 Part 5. Yorkshire and Humberside Region. (Price £1·50)
SD 15 Part 6. East Midlands Region. (Price £1·20)
SD 17 Part 8. London and South East Region. (Price £4·80)
SD 19 Part 10. West Midlands Region. (Price £1·70)

The new Monitors are available on standing order from:

Her Majesty's Stationery Office,
PO Box 569,
London,
SE1 9NH,

or can be purchased separately from Government Bookshops or through booksellers.

Construction industry contractors' census

The annual census relating the output and employment of private contractors in the construction industry for 1974 is expected to be published in March by HMSO.

This publication will contain seven historical tables showing trends in the number of firms, with their employment and output from 1967 to 1974. Thirty four detailed tables relating to 1974 are also included. These tables break down employment and output by size and trade of firm and where appropriate by craft and type of work, as well as by region of registration. Three of the tables show a comparison between the old and new regions, covering all the main variables.

Reference

Private contractors' construction census 1974 (HMSO) forthcoming.

AGRICULTURE

Agricultural Censuses and Surveys

The August 1975 Sample Pig Enquiry

The results of this enquiry in England and Wales and in the United Kingdom were published in a Statistical Information Notice on 13th October 1975. ([1])

The September 1975 Sample Agricultural Enquiry

The results of this enquiry in England and Wales were published in a Press Notice on 5th November 1975([2]). These show that both dairy cows and beef cows decreased in number compared with September 1974. The pig breeding herd decreased over the year but showed a small rise since June. The egg-laying flock increased slightly and the number of growing pullets rose compared with September 1974.

The June 1975 Agricultural Census

The final results of the June census in England and Wales, and those for the United Kingdom are both to be published in Statistical Information Notices.

Agricultural Statistics for the United Kingdom 1973

This recently published volume gives for 1973 the acreage and production of crops, and the numbers of livestock, agricultural holdings and agricultural workers in the United Kingdom, with separate figures for England and Wales, Scotland, Great Britain and Northern Ireland. The volume also contains monthly and annual price indices for main agricultural products and materials in the United Kingdom([3]).

References

(1) Statistical Information Notice (Stats 262/75) issued by the Ministry of Agriculture, Fisheries and Food.
(2) Press Notice No. 344 issued by the Ministry of Agriculture, Fisheries and Food.
(3) Agricultural Statistics for the United Kingdom 1973 (HMSO) (Price £1·77 net).

FINANCIAL STATISTICS

Money stock and transactions of the UK banking sector

The introduction of the new reporting forms for banks in 1975 has made it possible to estimate more accurately the extent to which monthly and quarterly changes in the sterling value of the banking sector's foreign currency assets and liabilities result from exchange rate changes rather than transactions. Figures in the regular table of banking sector transactions in the *Bank of England Quarterly Bulletin* are now adjusted to exclude, as far as possible, changes in valuation. It is also now possible to identify from the tables the changes in the money stock (M_3) excluding the effect of changes in the sterling value of UK residents' foreign currency deposits arising from exchange rate movements.

Analysis of bank advances

The December issue of the Bank's Bulletin contains the first in a revised series of analyses of advances to UK residents by banks in the United Kingdom and is derived from the new system of banking returns. For the first time estimates of the effects of exchange rate changes are included.

Overseas finance

An article in the December issue of the *Bank of England Quarterly Bulletin* describes and explains the official limits on foreign currency exposure by banks in the United Kingdom.

Copies of the Bank's Bulletin may be obtained, free of charge, from the

Economic Intelligence Department,
Bank of England,
London,
EC2R 8AH.

BRITISH AID STATISTICS

British Aid Statistics 1970/74

The latest edition of *British Aid Statistics*([1]) which was published in December 1975 provides comprehensive data relating to official flows from the United Kingdom to less developed countries of the world for the period 1970 to 1974 and also aggregated data relating to private flows. The information is broadly similar to that reported annually to the Development Assistance Committee (DAC) of the Organisation for Economic Co-operation and Development (OECD) but the presentation is modified to provide what is considered a more appropriate account of the British aid effort. The 1975 United Kingdom memorandum to the DAC, which reports the 1974 performance and provides additional information about United Kingdom development activities, was published as a White Paper in

September under the title *An Account of the British Aid Programme*(2). A second White Paper entitled *The Changing Emphasis in British Aid Policies – More Help for the Poorest* was published at the end of October 1975(3), and is the first comprehensive view of British Aid Policy to be published for eight years.

A certain amount of confusion can arise in the interpretation of these statistics because of the slightly different concepts of 'Aid' and 'Flows of Resources' which have been developed for domestic and international use. These differences are discussed in detail in an article 'The Organisation of Work on Aid Statistics' (*Statistical News* 26.6).

Figures for official flows according to the international criteria of net official development assistance (often referred to as official aid) and other official flows were set out in a note in the *Statistical News* of August 1975 (30.37). *British Aid Statistics* reveals that in 1974 net disbursements of the aid programme amounted to £305m (£341m gross less £36m amortisation) which is an increase of 26 per cent over 1974. Net other overseas aid rose from £6m in 1973 to £7m in 1974 making a total net public expenditure on overseas aid in 1974 equal to £312m, an increase of 26 per cent over 1973. This together with additional flows from other programmes of public expenditure, which amounted to £31m net of amortisation, amounts to total net official flows of £343m (£387m gross less amortisation of £44m) previously announced. Much of this increase reflects price rises between the two years but it also represents a rise in the proportion of Gross National Product at market prices from 0·37 per cent in 1973 to 0·42 per cent in 1974.

Total United Kingdom long-term private flows to developing countries rose in 1974 to £611m from the revised 1973 figures of £307m. This represents an increase from 0·42 per cent GNP to 0·75 per cent. Net export credits with maturities in excess of twelve months increased by £36m but direct investment accounted for most of the increase in total private flows. The increase in the value of stocks particularly in oil stocks on a world wide level during 1974 effectively increased the value of assets held overseas and the oil companies extended their exploratory operations in the Third World. Despite participation agreements with national governments their substantial investments in the Middle East were maintained.

Total official and private flows excluding Eurocurrency transactions, from the United Kingdom to developing countries were £980m in 1974 compared with £601m in 1973. In relation to GNP this represents a rise of from 0·83 per cent to 1·2 per cent; that is in excess of the international target of 1 per cent of GNP for official and private flows.

Euro-currency transactions are not included in the flows summarised above. They continue however to be an important source of finance for many developing countries and the increase in lending by UK resident banks to developing countries other than to 'off shore' banking centres is estimated at £1,355m in 1974 compared with approximately £1,000m in 1973.

Further comparative particulars on the development activities of all members of DAC are included in the Chairman's annual report published last November as the DAC 1975 Review(4).

References

(1) *British Aid Statistics 1970–1974* (HMSO) December 1975 (Price £5 net)
(2) *An account of the British Aid Programme – Text of United Kingdom Memorandum to the Development Assistance Committee of the Organisation for Economic Co-operation and Development* – Cmnd 6223 (HMSO) (Price 50p net).
(3) *The Changing Emphasis in British Aid Policies – More Help for the Poorest* Cmnd 6270 (HMSO) (Price 95p net).
(4) *Development Co-operation: Efforts and Policies of the Members of the Development Assistance Committee*, 1975 review OECD November 1975 (Price £5).

INTERNATIONAL

Conference of Commonwealth Statisticians

The Eighth Conference of Commonwealth Statisticians was held in Barbados from 24 November–5 December 1975. The Governments of Barbados, Guyana, Jamaica and Trinidad and Tobago were joint hosts. The Conference was formally opened by the Rt. Hon. Errol Barrow, Prime Minister of Barbados.

These Conferences were initiated more than fifty years ago to enable statisticians as well as users of statistics in the Commonwealth to exchange information about statistical development and techniques with a view to achieving international comparability.

Nearly all countries of the Commonwealth participated and there were observers from the United Nations Statistical Office, the Commonwealth Secretariat and interested inter-governmental regional bodies of the Commonwealth. The United Kingdom delegation was led by Sir Claus Moser, Director of the Central Statistical Office and Head of the Government Statistical Service.

Papers were contributed by most of the Commonwealth countries and among the topics discussed were the evolution of statistical programmes; statistics for manpower planning; censuses of population and population projections; macro-economic statistics; social statistics; industrial, business and agriculturel statistics; the organization of statistical offices, especially problems of statistical organization in developing countries.

EEC Seminar on multipurpose surveys and subjective questions

A seminar on the above topics was organised by the Statistical Office of the European Communities (SOEC) on 25–28 November 1975. The opening address by Mr Michael Shanks, Director General for Social Affairs of the EEC Commission, drew attention to the need for harmonised data as the basis for EEC social and related policies. The seminar discussed various models of multipurpose surveys used by Community members. The British General Household Survey was described in a paper by Mr Louis Moss, formerly Advisor on Survey Research at OPCS. The Micro-census, held in the Federal Republic of Germany, was among other surveys described.

Papers on subjective questions ranged from two papers on the use of straightforward intentions questions for migration and consumer behaviour presented by the French Institut National de la Statistique et des Etudes économiques (INSEE) to a paper giving examples of more complex surveys of perceived life quality by Dr Aubrey McKennell (Southampton University). Dr Mark Abrams (SSRC Survey Unit) described quality of life surveys with special reference to the series of surveys he has carried out in Great Britain between 1971 and 1975.

The proceedings of the seminar will be published by SOEC. In the meantime, further details and copies of the seminar papers can be obtained from:

Mr Hugh Baker,
Statistical Office of the European Communities,
Centre Européen,
Boîte Postale 1907,
Luxembourg.

Business Statistics Office Director visits Australia

At the invitation of the head of the Australian Statistical Service, Mr M C Fessey, Director of the Business Statistics Office, visited the Australian Bureau of Statistics in Canberra and the Statistical Office for New South Wales in Sydney, from 3 to 12 November, to discuss problems of common interest in the field of business statistics.

STATISTICAL METHODOLOGY

Comparisons of national accounts aggregates on the basis of purchasing power parities

An article in the November 1975 issue of *Economic Trends* briefly describes the results of the first phase of the United Nations International Comparisons Project (*Statistical News* 30.39) and examines methods of extrapolating these 'benchmark' results for 1970 to later years. The differences arising from the use of purchasing power parities, rather than exchange rates, as a basis for converting the per capita gross domestic product of different countries to a common unit of measurement are shown to be particularly significant when comparing the United Kingdom with most other major industrialised countries.

Manufacturers' stocks

An article in the January 1976 issue of *Economic Trends* gives details of an important development in the methods used for estimating the value of physical changes in manufacturing industry stocks. Since the beginning of 1973, contributors to the Department of Industry's monthly and quarterly stocks enquiries have been asked to separate stocks valued at 'standard costs' from those valued by other methods. The main advantage of this development is that the new statistics provide a more direct approach to the problem of estimating physical change. About a third by value of the manufacturing stocks in the inquiry are being treated as at standard costs, and the article explains the new system in some detail.

The article also summarizes the results of a questionnaire sent out in 1974 to a number of respondents giving stocks figures at standard cost, the information from which enabled valuable refinements to be made to the methods used. A paper giving a full tabulation of results of this questionnaire together with a more detailed treatment (than in the article) of certain other aspects can be obtained from:

Department of Industry,
Economics and Statistics Division 4A,
Room 714,
Sanctuary Buildings,
20 Great Smith Street,
London SW1P 3DB,
Telephone No. 01 215 3543 or 5215.

Applications of statistics in the Aircraft Department, Royal Navy

The Aircraft Department Royal Navy has, as part of its responsibilities, to decide the numbers of spare aircraft and aero-engines required to maintain the Fleet Air Arm at full operating strength. All spare airframes and engines must usually be ordered early in the Service life of an aircraft and so the Department needs to make an early decision on the quantity of spares to be purchased, taking into account the damage and losses likely to be incurred in operating each type of aircraft through to the end of its Service life. This is where the major problem lies, in making accurate forecasts of future loss and damage rates and it is in

this area that Stats(S)3 branch of the Defence Statistics Organisation is helping Aircraft Department to develop improved methods of forecasting for both airframes and engines.

The forecasting of airframe damage has been approached through an analysis of historical data, from both Royal Navy and other sources, that has identified many of the major factors affecting the overall damage and loss rates applicable to any aircraft type. Using the results from this analysis models have been developed that provide better forecasts for aircraft types with which there has been reasonable operating experience and consequently for which some historical information is available.

With new types of aircraft, however, there is little or no operating experience at the time the forecasts are required, and so a different approach is necessary. The most straightforward way of producing forecasts in these circumstances involves the use of subjective estimates of likely damage rates which are made by technical experts on the basis of their knowledge and experience. How best to pool their estimates is still the subject of study and trials are being carried out currently to assess the usefulness of the Delphi technique(1) which involves a number of experts making independent assessments on the basis of their own stated assumptions; these assessments are then pooled and fed back to the experts and a concensus eventually evolved.

In calculating the numbers of spare airframes required the emphasis has been on estimating the loss and damage rates. Since both rates are very low the effects of repair times can be introduced into the calculation in a simple way, without significant loss of accuracy. When calculating the numbers of spare aero-engines required the emphasis is, however, quite different. Engines are more prone to serious damage than airframes; large numbers therefore appear for repair and the effects of variation in repair time (and many other parameters) are of great importance in determining the number of spares which will be needed. Problems relating to aero-engines are therefore being studied using a simulation programme which was written by Rolls-Royce (1971) Ltd. A model of the engine repair cycle has been developed and used to estimate requirements for spare engines and also to identify potential future problems in the management of aero-engine repair so that appropriate corrective action may be taken at an early date.

For further information on the statistical techniques employed, please contact:

R Newton,
Stats(S)3,
Tavis House,
1–6 Tavistock Square,
London, WC1H 9NL.

Reference
(1) '*Subjective Probability and its Measurement*' by J. M. Hampton, P. G. Moore and H. Thomas. **Journal of Royal Statistical Soc. A (1973) 136 Part k p 21–42.**

Five per cent sample survey of building society mortgages

Studies in Official Statistics No. 26, published in November 1975, describes the 5 per cent sample survey of building society mortgages in the United Kingdom, which is currently the principal source of detailed official information on the private sector housing market. The survey is run by the Department of the Environment (DOE) in co-operation with the Building Societies Association (BSA).

The publication contains a description of the survey; description and comment on some of the principal results from 1966, when the survey was started, to 1974; a comparison of the survey's results on new house prices with other building society sources; and an outline of current developments in related housing market statistics. The description of the survey covers its history, coverage, questionnaire, analysis, and publication of results; also included is a list of detailed tabulations which are not published, but which may be obtained for private use from the DOE. Results covered include house prices, advances, deposits, and incomes of borrowers, for all mortgages, new and secondhand houses, previous and new owner-occupiers, and by region. The section on new house prices compares the figures from the survey with the DOE and BSA's alternative and older series of new house prices, currently published in *Housing and Construction Statistics*, Tables 3 and 1, and with the figures published by the Nationwide Building Society in its *Occasional Bulletin*. The final section on current developments mentions new information becoming available from the building societies themselves, from local authorities, and from the Inland Revenue Valuation Office.

The principal quarterly results from the 5 per cent sample survey of building society mortgages are published in a DOE press notice in the second month after the end of each quarter. These and other results are subsequently published by the DOE in *Housing and Construction Statistics*, Table 38 and supplementary tables, and by the BSA in its bulletin *Facts and Figures*.

References
(1) *The five per cent sample survey of building society mortgages, Studies in Official Statistics*, No. 26, by A. W. Evans (HMSO) (Price 95p net).
(2) *Housing and Construction Statistics*, quarterly (HMSO) (Price £1·40 net).
(3) *Occasional Bulletin*, quarterly, Nationwide Building Society.
(4) *Facts and Figures*, quarterly, Building Societies Association.

Royal Statistical Society study group

The Royal Statistical Society has recently set up a new study group to promote interest in surveys and social statistics generally among statisticians and others. Government speakers have taken part in the first two meetings; Louis Moss of OPCS in January as a discussant in a meeting on 'Public Opinion Polls', and Muriel Nissel and Deo Ramprakash of the CSO in February, speaking on the 'Measurement of Income Distribution".

Three other meetings are planned for the present session. On 2 March at 5.00 in the London School of Hygiene, Sir Maurice Kendall will be talking on the 'World Fertility Survey'. On 13 April at 4.30 at the London School of Hygiene Barry Hedges and Eileen Goddard will be talking on 'Sampling Minority Groups', and on 18 May at 4.00 in Birkbeck College, John Goldthorpe will be talking on 'Measuring Social Class'. Further details of meetings will be advertised in the Royal Statistical Society monthly diary card.

The study group would like to encourage those who are working in this area to participate in the meetings. Non-fellows of the society may attend as guests of fellows, and if they wish to take a more active part in the study group's activities may wish to consider becoming a member of the study group and general applications section of the society.

OTHER PUBLICATIONS

Bank of England Statistical Abstract No. 2

The Bank of England have published an updated *Statistical Abstract*. The first issue was published in 1971 and gave long runs of quarterly (and monthly) figures on financial subjects. Where possible the period 1945–69 was covered. The tables were presented mostly in the same format as in the Bank's Quarterly Bulletin. The new *Abstract* continues these series and covers, generally, the years 1970–74.

Copies of the *Abstract* are available from the
Economic Intelligence Department,
Bank of England,
London,
EC2R 8AH.
Price £3. Both issues may be bought for £4.

National Institute Economic Review

The November issue of the *National Institute Economic Review* contains, in addition to the usual discussion of current economic developments and prospects at home and abroad, four articles, two on economic policy-making, one is a comparison of earnings in the public and private sectors, and the fourth is on the effect of exchange rates on export market shares.

In 'The New Cambridge and monetarist criticisms of conventional economic policy-making' by J A Bispham, there is a discussion of the increasing criticism of what may be called 'conventional' economic policy-making. The methods of forecasting and analysis used at the National Institute and elsewhere are at the centre of this type of policy formation, and, although there have certainly been forecasting errors, the conclusion of this article is that nothing better has been proposed. This is certainly true of the New Cambridge view of the balance of payments which always had many theoretical difficulties, but which has now, it is demonstrated, also fallen down empirically.

The school which is here labelled Monetarist is defined rather widely and probably includes somewhat divergent strains of thinking. They have in common, however, that they reject the cost-push explanation of inflation in favour of a monetary/excess demand theory. Attention is restricted to those who have commented on the UK situation. It is the central contention of this section of the article that the case is not proven by the sorts of 'evidence' which tend to be adduced. It is much more likely that the relatively painless monetarist cure for inflation is not a real option at all, but a mirage resulting from excessive concentration on statistical correlations of quarterly post-war data. A much broader view considers the important implications of the shift from the pre-war world to the 'full employment welfare state'.

The second of the articles on economic policy-making is that by A P Budd of the London Business School: 'The debate on fine-tuning: the basic issues'.

'Fine-tuning' can be defined as frequent discretionary adjustments to policy instruments. This article attempts to isolate this issue from a multiplicity of criticisms directed at UK economic policy-making. The attack on fine-tuning itself by the New Cambridge and the Manchester monetarist schools is shown to be connected essentially with the view that the economy is stable (that is returns to equilibrium in the absence of discretionary intervention). Nevertheless, even if the economy is stable, optimal control theory suggests that policy adjustments could be desirable, essentially because they could, at least in principle, speed the return to equilibrium. A more fundamental question concerns the way in which the private sector form their expectations; if they are 'rational', that is based on information at least as good as the authorities', then the grounds for discretionary intervention by the authorities are greatly diminished. These issues all require further empirical investigation.

'Earnings in the public and private sectors 1950–1975' by A J H Dean analyses the trend of earnings in the public and private sectors of the British economy. It

was found that public and private sector earnings moved closely together throughout the 1950s and 1960s but then diverged considerably in the early 1970s, with public sector earnings moving ahead of private sector earnings in an unprecedented fashion in 1974 and 1975; given the earlier stability in relative earnings, this movement might be temporary. There was a significant difference in the cyclical behaviour of the two series with public sector earnings generally increasing faster than private sector earnings during the downswing and *vice versa* during the upswing; this finding is consistent with the lesser exposure of the public sector to market pressures. Incomes policy does not appear to have affected relative earnings in any systematic way.

The changes in the exchange rates of the major exporters of manufactures between 1967 and 1971 ('The effect of exchange rates on export market shares' by Mrs S A B Page) were followed by substantial changes in their export performance measured against trends before the realignment, indicating that the devaluations and revaluations were effective, contrary to some preliminary assessments. Changes in relative prices are a good explanation of the previous trends, as well as the basic reason for expecting effects from exchange rate changes. The results under fixed rates cannot therefore be applied under floating rates as these reduce, if they do not eliminate, relative price changes converted to a common currency.

Publications of the European Communities

The following publications of the European Communities have been received since the last list was published in *Statistical News*.

Social Statistics (Special Series)
statistiques sociales (serie spéciale)
1975
No. 1. Structure of earnings in industry 1972
Methods and Definitions
(d.f.i.n.e.dk.)

Social Statistics
(statistiques sociales)
1975
No. 2 Harmonised statistics of gross hourly earnings and hours of work – October 1974
Supplement to No. 2 – 1973
Population and employment in the countries of the Community – 1970 to 1973

Supplement to No. 5 – 1973
Pupils and students – within the Community – 1971 to 1974
levels and types of education

1975
No. 1 Labour Force Survey – 1973
Methods and Definitions
1975 Industrial accidents in the Iron and Steel Industry
Results of surveys from 1960 to 1973
(d.f.i.n.e.dk)

Statistical Studies and Surveys
(Etudes et enquêtes statistiques)

1975
No. 1 Public expenditure on research and development in the Community countries – 1974
(d.f.i.n.e.dk)

Balance of Payments
(Balances des paiements)
1974 Balance of payments information covering the period 1963–1973
(d.f.i.n.e.dk)

Updated river pollution survey of England and Wales

This report produced jointly by the Department of the Environment and the Welsh Office updates for 1973(1) the original river pollution survey of 1970. The report is the second updating with regard to discharges of sewage and industrial effluent. The first was produced in respect of 1972(2).

The report records a further improvement in the chemical quality of rivers and canals and a decrease in the number of discharges of sewage and industrial effluent into these waterways.

The report classifies rivers, canals and tidal waterways according to the standard of pollution into four categories, Class 1 unpolluted, Class 2 doubtful, Class 3 poor, Class 4 grossly polluted. Lengths of waterways so classified are given in miles and kilometres throughout the report. The opening chapter headed Achievements 1972–73 gives a comparison of the chemical quality of rivers and canals in 1972 and 1973. The second chapter is concerned with the methods used to update the original survey. Further chapters include tables showing changes in chemical quality of rivers by the river authorities responsible for them. These authorities have now been superseded by the new water authorities.

Chapter four is concerned with the biological quality of waterways and contains tables classifying rivers, and canals by four categories on a biological basis. Changes in the number and quantity of discharges are considered in chapter five. Tables give details for individual river authorities.

An appendix to the report contains tables showing river and canal quality and discharges on the basis of the new water authority areas. Maps at the front of the report show the areas of the old river authorities and the new water authorities.

References

(1) *River Pollution Survey of England and Wales updated 1973. River Quality and Discharges of Sewage and Industrial Effluents.* (HMSO) (Price £2·60 net).

(2) *River Pollution Survey of England and Wales updated 1972. Discharges of Sewage and Industrial Effluents.* (HMSO) (Price 50p net).

Survey Control Unit

Surveys assessed

In the fourth quarter of 1975 the Survey Control Unit assessed 103 surveys of which 78 were new and 25 existing or past surveys not previously notified to the Unit. A brief article in *Statistical News* (21.15) outlined the work of the Unit and the system of grading used, while the recent computerisation of the Unit's records is described in (31.22).

Table A Surveys assessed during fourth quarter 1975

Type of survey	*Initial grading*				*No grading given*	*Total*
	Unrecognised	*Under consideration*	*Provisional recognition*	*Full recognition*		
Small *ad hoc*	–	5	25	33	10	73
Other *ad hoc*	–	4	4	9	3	20
Continuous	–	–	1	7	2	10
Total	–	9	30	49	15	103

The decrease in total numbers compared with the corresponding quarter of 1974 when one hundred and eighty three surveys were assessed is due to the high number of existing surveys assessed in that quarter. The total of one hundred and three in the fourth quarter of 1975 is made up of surveys from a wide range of Departments; the largest number being thirty-two initiated by the Department of the Environment (including seven by the Transport and Road Research Laboratory).

The Unit assesses both new and existing surveys and also receives details of some surveys that have already been completed. The following tables summarise the numbers of surveys assessed in 1974 and 1975.

Table B Initial grades of new surveys assessed

	1974	1975
Full Recognition	207	159
Provisional Recognition	109	108
Under Consideration	19	42
Unrecognised	4	3
No Grading Given	22	46
Total	361	358

The lower proportion of new surveys given full recognition initially (57 per cent in 1974 and 44 per cent in 1975) reflects a tendency for details to be received at an earlier stage.

Table C Types of new surveys assessed

	1974	1975
Ad hoc (including annual and less frequent)	323	331
Continuous (more than once a year)	38	27
Total	361	358

Although only a small proportion of new surveys assessed are continuous (11 per cent in 1974 and 8 per cent in 1975), the Unit constantly monitors changes in inquiries, but when an assessment is made such surveys are indicated as 'old' or existing inquiries.

Table D Total surveys assessed

	1974	1975
Newly launched	361	358
Old (existing or past)	359	241
Total	720	599

GOVERNMENT STATISTICAL SERVICE

Appointments and changes

Central Statistical Office

Miss S. P. Carter, Statistician, Central Statistical Office, was promoted to Chief Statistician with effect from 15 January 1976 to fill the vacancy in Branch 5.

Ministry of Overseas Development

Mr C. C. Greenfield, Statistician, Ministry of Overseas Development, was promoted to Chief Statistician on 10 November to fill the vacancy in Branch B.

Late Item

The Institute of Statisticians 1976 Conference on **Forecasting** will be held at King's College, Cambridge, July 7–10.

A very distinguished group of speakers have agreed to participate. These are:

Professor G. A. Barnard
Professor E. M. L. Beale
Sir Paul Chambers
Professor P. J. Harrison
Professor G. M. Jenkins
Sir Maurice Kendall
Dr P. Newbold
Mr E. H. Simpson
Professor P. Whittle

Further leading authorities have agreed to provide papers *in absentia*, including:

Professor R. J. Ball
Professor C. W. J. Granger

Application forms and further particulars are available from

The Secretary,
St Edmunds House,
Lower Baxter Street,
Bury St Edmunds.

Early booking is strongly advised, as it seems likely that this conference will be heavily over-subscribed.

List of Principal Statistical Series and Publications

1974 EDITION

Amendment list no. 6 — October to December 1975

Introductory note

The *List of Principal Statistical Series and Publications*, first published in 1972, has been revised. In the 1974 edition, published in November 1974 (HMSO Price 80p net), it is stated that details of important amendments and additions to the list will appear quarterly in *Statistical News* thus enabling users to keep their copies up to date. Accordingly a list of amendments, covering the period from October to December 1975 is given below. Off-prints of this list can be obtained from the Central Statistical Office, Telephone: 01–233 8234.

Amendments to Part 1. List of Principal Series

Population and Vital Statistics

Page

1. Population statistics
   (a) Census of population figures — 1

Add footnote (2) to Occupation, Industry and socio-economic class and Workplace and transport to work

2. Migration
   (a) Migration into and out of the United Kingdom — 2

Delete *Quarterly Return for England and Wales*
Insert *Population Trends, OPCS Monitor Reference MN*
   (c) Delete Immigrants. Insert Immigration control. In the text after 'foreign nationals' Insert 'and EEC nationals'

Social Statistics

3. Health and personal social services
   (a) Notifications of infectious diseases — Annual — 4

Delete *Statistical Review of England and Wales, Part I*
Insert *Statistics of infectious diseases*

Transport and Communication

4. Air transport — 15

Add *CAA Annual Statistics* to each of the sub-heads (a), (b), (c), (d), and (f)

External Trade

2. Visible trade
   (d) Trade by air

Add to list of publications: *CAA Annual Statistics*

Amendments to Part II. List of Publications

Page 33

Agricultural Statistics, Scotland
Delete £1·04 (1973) Insert £1·90 (1974)

Agricultural Statistics, United Kingdom
Delete £1·00 (1972) Insert £1·77 (1973)

Annual Abstract of Statistics
Delete £4 (1974) Insert £5·80 (1975)

After **Bankers' Clearing House Monthly Clearing Statistics**
Insert **Betting Licensing Statistics (June 1974–May 1975)** 50p — Annual — Home Office

British Aid Statistics
Delete £3 (1969 to 1973) Insert £5·00 (1970 to 1974)

Footnote (1)
Volume III
Delete £10·00 Insert £18·00
Volume IV
Delete £8·00 Insert £11·00
Volume V
Delete £5·10 Insert £10·00

Page 40
Delete symbol (4) from Business Monitor PA 496
After **CAA Monthly Statistics** Add the following new entry:

CAA Annual Statistics £4·00	Annual	Civil Aviation Authority	15, 31

Page 41

After **Census 1971, Great Britain, Economic Activity**			
Add: **Census 1971, Great Britain, Household Composition Summary Tables, 10% sample. £2·50**		Office of Population Censuses and Surveys	1
After **Census 1971, England and Wales, Households**			
Add: **Census 1971, England and Wales, Household Composition Tables 10% Part II £5·30 Part III £5·90**		Office of Population Censuses and Surveys	1
After **Census 1971, England and Wales, Usual Residence Tables**			
Add: **Census 1971, England and Wales, Workplace and Transport to Work Tables 10% Sample Part I £13·50**		Office of Population Censuses and Surveys	1

Civil Service Statistics
Delete 75p (1973) Substitute £1·75 (1975)
Digest of Housing Statistics for Northern Ireland
Delete 18p Substitute 27p
Digest of Statistics, Northern Ireland
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Generally speaking articles relating to United Kingdom, Great Britain, England and Wales or covering several geographical groups are not indexed under these groups, but topics with a significant regional interest are indicated e.g. regional earnings. Articles and notes dealing particularly with Scottish statistics are indexed under 'Scotland' as well as the topic, e.g. 'Scotland, population projections', and similarly for Wales and Northern Ireland.

The following conventions have been observed in printing this index: references to items appearing in articles are shown by (A); italics are used for the titles of published books or papers.

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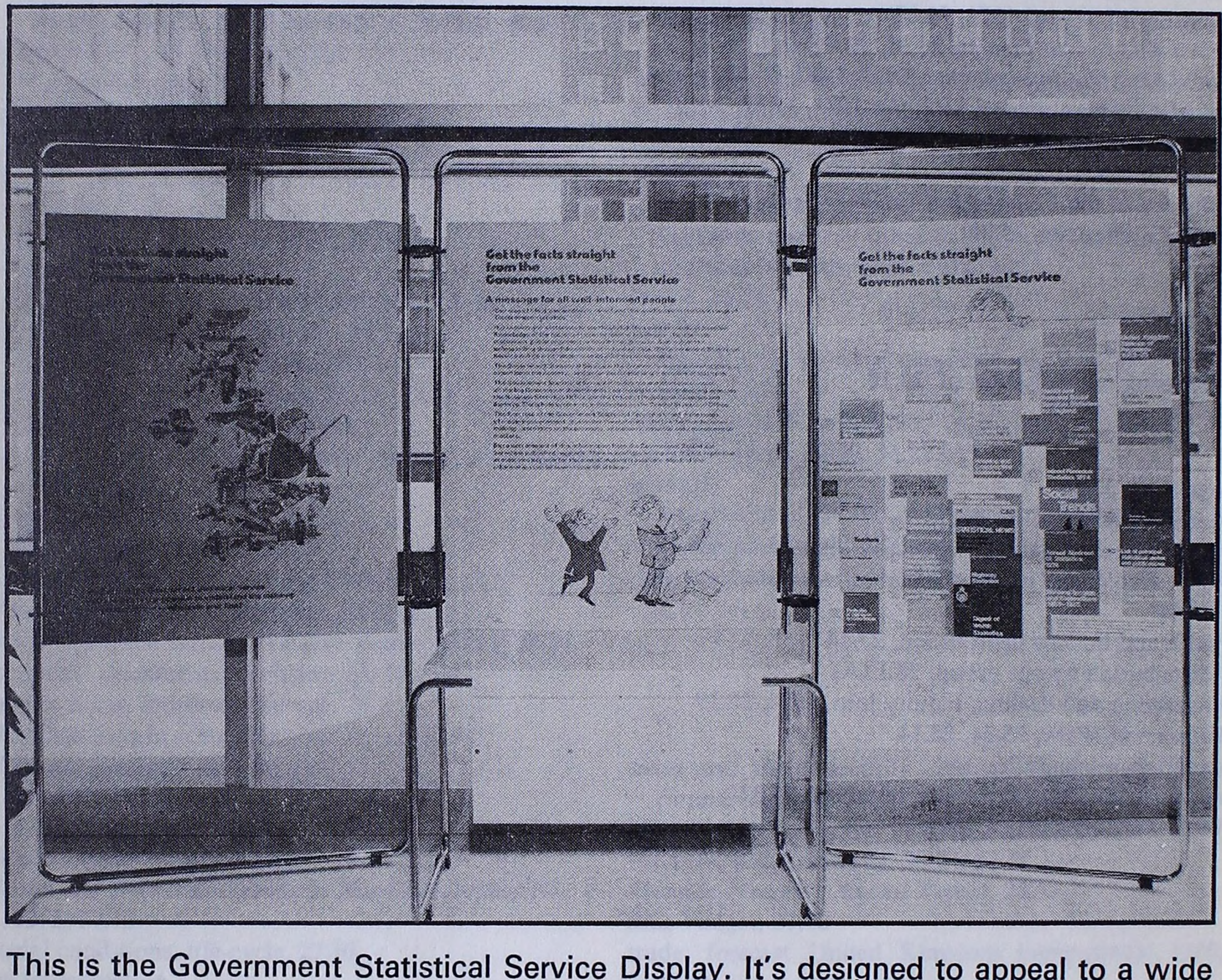

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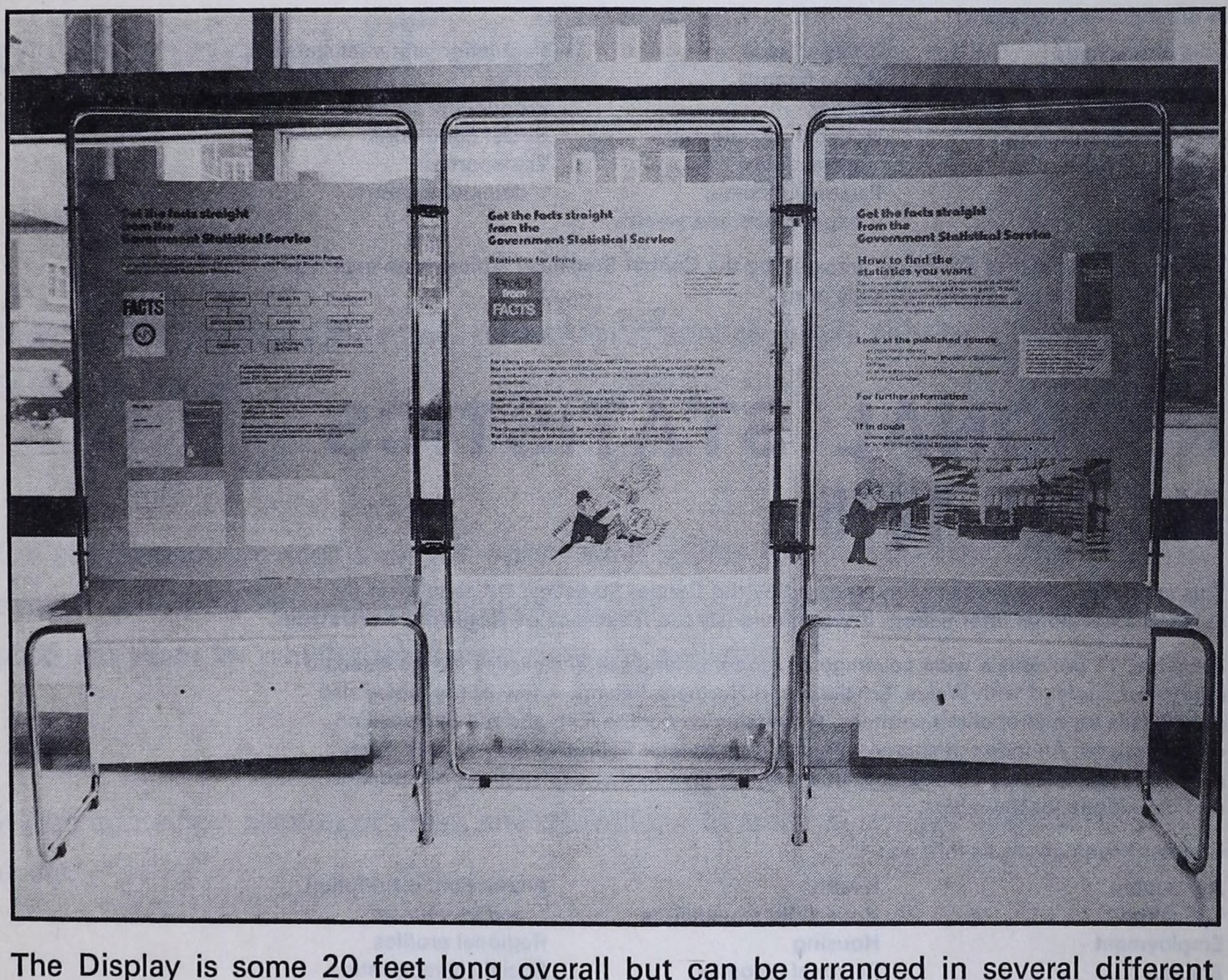

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