Bank of England

Discussion Paper No.5

Bank of England model of the UK economy

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Bank of England Discussion Papers

*This paper is no longer available.

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Many people have contributed to the development of
the model. This paper has been written by A.R.Latter
with assistance from the staff of the Bank's
Economics Division.

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Contents   Page

</div>

Introduction

Scope of the paper

1 This paper presents the Bank of England's main macro-economic model of the United Kingdom. Part 1 provides a brief description of the linkages in the model and discusses some aspects of its development and usage. In Part 2 all the equations are listed; a short explanatory text precedes each group of equations. Part 3 catalogues all the variables that appear in the model. The paper refers throughout to the version of the model current in August 1979.

2 The limited aim of this paper is to lead the interested reader through the structure of the model, and to act as a reference source to it. Such matters as underlying theory and related research, although mentioned in passing at various points, are not dealt with exhaustively. Nor are any tests or properties of the model as a whole reported systematically. These omissions are necessary in order to keep the paper to manageable dimensions.

Outline and nature of the model

3 The model is a quarterly, structural one of the income, expenditure and financial inter-relationships in the UK economy. Most of the model is based on seasonally-adjusted time series, exceptions being those areas where official statistics are not available in seasonally-adjusted form.

4 The components of real demand are determined broadly as follows. Consumer spending depends on real disposable income and real net liquid asset holdings. Private residential investment depends mainly on the availability of mortgage finance. Private non-residential investment is modelled by the accelerator process, i.e. it is dependent upon the rate of change of output. Stockbuilding is derived from an approach which allows, in effect, for short-run disturbances around some trend in desired stock-output ratios. Public sector consumption and investment are exogenous. Exports depend principally upon world activity and competitiveness, and imports on home demand, competitiveness and the speed with which domestic output responds to changes in demand.

5 Gross domestic product (GDP) is therefore predominantly
demand-determined.   Employment follows from output and from equations
which model short-run adjustments to the longer-term trend in
productivity; this underlying trend does vary, but the model lacks
any economic specification of its determination. Unemployment follows
by reference to demographic projections and assumptions about activity
and registration rates.

6 Earnings are specified as a mark-up on past prices, the mark-up
being exogenous.   Allowance is made for the effect of changes in the
average rate of income tax and national insurance deductions.
The level of activity is not specified to have any direct effect on
pay settlements, but does affect average earnings, through overtime.

7 World prices in dollars are exogenous, as is the dollar's
effective exchange rate.   The sterling/dollar exchange rate is
modelled in two stages: first, pressure on the exchange rate is
calculated by reference to relative rates of inflation and monetary
expansion at home and in the United States, interest-rate differentials
and the recent performance of the current account; expectations
about future movements in the exchange rate are also taken into
account.   A reaction function then distributes the effect of pressure
between changes in the reserves and movements in the sterling/dollar
rate.   The latter combines with the effective exchange rate for the
dollar to yield the effective rate for sterling.

8 Productivity, earnings, world prices, the exchange rate and indirect
taxes are the main determinants of domestic prices, which are,
broadly speaking, modelled in relation to historic costs.   Two forms
of price expectations are depicted, one based on price behaviour and
the other on monetary developments.   Export prices are determined
partly by domestic prices and partly by competing overseas prices.
Current price components of GDP are obtained by grossing up real
amounts by relevant price indices.

9 Interest rates are related at the short end to euro-dollar
rates (which are exogenous), price expectations, pressure
on the exchange rate and movements in the reserves; and at
the long end to the short rate, price expectations and the size
of the public sector borrowing requirement(PSBR).   Flows of interest

etc. between sectors are derived in a variety of ways - in the case of the overseas sector within a disaggregated stock-flow framework.

10 The volume of public spending on goods and services is exogenous. Other public disbursements, such as debt interest and some grants, are related endogenously to other relevant variables. Public sector receipts are mainly calculated by applying tax rates to relevant income or expenditure flows. Trading surpluses of public corporations largely match the behaviour of private sector profitability.

11 Sectoral accounts are built up, above the line, from the various income and expenditure flows, to produce financial surpluses and deficits. A flow of funds matrix is embodied in the model, which determines the flows which take place below the line. The matrix identifies six sectors and some twenty-five types of financial instrument. Among the most important of the equations here are those for persons' net acquisitions of liquid assets, involving a desired ratio of such assets to income; for gilt-edged sales, modelled in accordance with portfolio adjustment principles, taking account of interest rates and price expectations; for bank lending, based on portfolio adjustment in a similar manner; and for flows into building societies, which depend mainly on personal incomes and interest-rate differentials, and which are in turn the main determinant of the societies' lending. External capital flows are modelled variously, but consistently with portfolio adjustment, with a group of short-term flows bearing the role of constraining the balance for official financing to be consistent with the reserve change determined by the exchange rate section of the model. Aggregates such as domestic credit expansion (DCE) and the change in the money stock follow by summation of relevant financial flows.

12 Although most variables covering world developments, such as commodity prices and imports of other countries, are exogenous to this model, some of them are nevertheless modelled by the Bank. For example, use is made of HM Treasury's World Economic Prospects model to provide input on world output and trade to the Bank model.

13 As it stands, the Bank model is more suited to analysis of the short-term than the long-term behaviour of the economy. One reason for this is that the supply side of the economy is not modelled

explicitly so that, although there are mechanisms which limit the
pace at which supply adjusts to demand, there is no ultimate
constraint on supply.

14   Nor is the demand for money modelled explicitly, but demand
factors are present, as evidenced, for example, by the existence of a
demand-function for persons' holdings of net liquid assets;   also the
modelling of pressure on the exchange rate implies some demand-for-money
function.   Moreover, the banks play an entirely passive role in the
model, so that they supply such money as is demanded of them. On the
other hand, exogenous policy decisions in part determine the PSBR,
and the authorities are deemed to pursue a specific intervention
strategy in the foreign exchange market: these factors are important
supply-side influences on money.   It is the composition of and
interplay between various demand and supply factors which yields the
path for money.

15   Financial variables feed back significantly to several other
parts of the model - to consumption, for example - but the direct
leverage is not in aggregate very great;   the stronger influence is a
less direct one, through the effect of monetary growth on the exchange
rate, and hence on trade flows, inflation and so on.

16   Fluctuations in the pace of inflation may arise for a variety of
reasons, but the overall pressure of demand does not play a precise
part.   The underlying rate of inflation is mainly determined by the
trend rate of productivity growth, the mark-up of pay settlements
over prices, and world prices - all of which are exogenous to the
model - and by the exchange rate.   The most distinct influences of
financial factors on prices are to be found in the chain running from
money to the exchange rate to prices, and in the determination of
house prices.

17   Only in the exchange rate sector has the attempt so far been
made fully to endogenise the reactions of the authorities.   Possible
official actions in other spheres, such as to achieve fiscal or
monetary goals or to contain incomes, are not embodied explicitly
in the model, although they may partly be implicit in some behavioural
equations, such as those for interest rates.

18 Some would describe the model as 'Keynesian' because it adopts
a structural, income-expenditure approach and lacks a long-run supply
side.   But the role of certain financial flows, the absence of strong
direct interest-rate effects on expenditures and, in particular, the
modelling of the exchange rate, all set the model at some distance from
what the word 'Keynesian' usually means.   Some of the mechanisms
bear the characteristics of international monetarism, but the similarity
is limited because, for example, the model is a long way from
adhering to the 'law of one price'.   Thus, tempting though it may be
to classify models into certain stereotypes, there is no such niche
to which the present model unequivocally belongs.

Development and use of the model

19 Work with a model started in the Bank in 1972, when the London
Business School's model was made available.   This served as a foundation
on which to base a programme of work, which has by now resulted in a
model which bears little resemblance to its ancestor.   The Bank's
incursion into modelling was part of a move to develop further within
the Bank an independent capability for policy analysis and advice.

20 Judged by the number of identified time series, the model is quite
large:

Approximate numbers of variables

Defined by behavioural equations	175
Defined by technical equations	115
Defined by identities	210
Exogenous, other than dummies	175
Dummies	45
Total	720

Technical equations are definitional or linking equations which
nevertheless carry error terms: some may be intended identities for which
precise data are not, however, available;   others are simple mechanisms,
such as indexation;   in some cases, the borderline between behavioural and
technical may be unclear, but the attempted distinction is nevertheless
considered useful.

21 There are two, related, operational considerations which have
tended to expand the size of the model.   First, for policy analysis,

a greater degree of disaggregation may be required than standard econometric criteria would necessarily demand. Secondly, for ease of operation, it is best to identify as many relevant policy instruments as may be required, in order to save off-model work manipulating composite variables: for this reason, for example, the model identifies a considerable number of indirect tax rates. It is true, however, that in some parts of the model disaggregation has proceeded further than even these criteria might demand, for, although additional technical equations or identities may not increase the econometric complexity of the model, they impose extra burdens in, for instance, data assembly. Attention will be given in future work to the appropriate degree of aggregation.

22 It is hardly possible to contemplate estimating an entire model of this size simultaneously. Where estimation has taken place, it has generally been carried out by simple least squares - ordinary and autoregressive - for individual equations. In one or two instances, instrumental variables have been employed to tackle simultaneities, and non-linear estimation has been used in places. Particular attention has been paid to the dynamic properties of individual equations: partly because of the independence of research effort, this has resulted in a varied range of lag treatments. The estimation period for equations that have been adopted has usually been the longest for which consistent data were available at the time of estimation, though shorter periods have been used where there was evidence of structural change.

23 Where feasible, relationships estimated econometrically have been adopted for the behavioural equations in the model. There are many behavioural equations, however, whose structure or coefficients are partly or wholly imposed judgmentally. This happens either because the results of empirical research are not plausible, or because insufficient research has yet been conducted. Because of simultaneities within the model, it is not in any case necessarily appropriate to accept equations that have been estimated in isolation, although bias may in many cases be negligible and, where not, its direction may not be obvious. In acknowledgement of the potential shortcomings of the single equation approach, it is agreed practice

to examine, by simulation, what properties an individual equation endows to the model as a whole before deciding whether to adopt it.

24   The model, as listed in Part 2 of this paper, includes various technical equations which are not designed to describe the past but which are used, when no contrary guidance is available, to represent policy neutrality when using the model for simulation or forecasting. Examples are the equations for income tax allowances and specific duties, which incorporate annual indexation for inflation.

25   It was stated earlier that the model is better suited to the study of short-term than of long-term interactions.   Shortcomings, like the absence of endogenous determination of either the real wage or productive potential, limit the usefulness of the model as a tool for the analysis of longer-term developments.   It is hoped in due course to improve the longer-term characteristics of the model.[1]

26   Earlier this year, all relevant equations were re-estimated with the new national accounts data based on 1975 prices, and necessary revisions to the model were decided.   In some cases, where existing specifications broke down, the former equation, with suitably re-scaled coefficients, was retained, pending further research.

27   The need for further development work is heightened by the weaknesses which re-basing has exposed.   Among those areas of the model which particularly require attention are stockbuilding, fixed investment and prices. In addition, more tests of the properties and performance of the model as a whole are planned.   It is important, however, to note that the model, particularly in the context of forecasting, can only usefully be employed in conjunction with the exercise of judgment by those who are both familiar with the model's properties and alert to contemporary economic developments. Such judgments determine, for example, forecast paths for exogenous variables and for error terms in the stochastic equations, and the treatment of time trends, all of which are major influences on the results that the model will yield.   Moreover, there is, of course, freedom to amend or override equations or substitute new ones at any time.

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[1] Work is in progress in the Bank to develop a separate, smaller, annual model specifically for medium-term analysis.

The model in detail

Introduction

28 This part lists all the equations in the model, each group being preceded by a short introductory text. Definitions of codes, for both endogenous and exogenous variables, are given in Part 3. The exception is that not all dummies are listed: where these appear on the right-hand side of equations (recognisable by codes beginning with 'D' and containing figures) without being listed in Part 3, their role is usually mentioned in the text of Part 2. Many of the definitions in Part 3 are in abbreviated form and sources are not listed. Further information about the series can, however, be supplied to enquirers.

29 Estimated equations are recognisable from the inclusion of 'test' statistics; an indication of the estimation period is also given. The figures in brackets beneath coefficients are t-statistics. An asterisk preceding an equation means that the equation was estimated with 1970-based data and that the parameters have merely been re-scaled to operate with 1975-based data.

Consumers' expenditure

30 The principal behavioural equations are those for spending on durable goods and non-durable items (including services): the latter category comprises some 90% of total consumer spending. The major explanatory variables are real incomes and real net liquid asset holdings.

31 A distinction is made between persons' income from government current grants and other disposable income. It is assumed that all income of the first kind is spent on non-durables within three quarters. The remainder of the estimated equation for non-durable consumption includes other income and the real value of persons' holdings of net liquid assets. There are dummies to capture anticipatory effects of certain Budgets.

32 Three simple equations determine the proportions of non-durable spending on beer, on wines and spirits and on tobacco. Each contains a

time trend and a relative price term.   For beer and tobacco there is also a term which accounts for the contra-cyclical nature of spending on these items relative to other goods.   This disaggregation assists in the calculation of indirect tax revenues (paragraph 124).

33 Spending on durable goods is related to permanent non-grant income; to hire-purchase controls; to net liquid asset holdings; to mortgage lending, so that spending on durables is, in effect, positively associated with turnover in housing; and to the existing stock of durables, with spending being lower in the short term the larger the stock. The stock of durables is modelled on a perpetual inventory basis.

34 The equations for durable and non-durable consumption follow from work by Townend (1976).   They do not give unequivocal support to any particular theory.   Thus, it is not clear whether real liquidity is important per se, or whether it acts as a proxy for either wealth in general or for inflation.   Research on this and alternative specifications of the consumption function has not, however, rejected the hypothesis that persons strive for a certain ratio of liquid assets to income, and this structure is indeed imposed in the financial sector of the model (see paragraph 137).

35 The fit of the equations did not improve significantly on introduction of such broader wealth variables as were available at the time the main research was undertaken (improved wealth statistics have since become available).   Nor have significant roles for unemployment (as a variable proxying precautionary behaviour) or credit availablility been found. Research has revealed that the scale of contributions to life assurance and pension funds influences consumption [see Threadgold (1978)], but such an influence is not at present embodied in the model. Finally, separation of vehicles from durables does not assist the overall fit; spending on vehicles, which enters the calculation of petrol consumption (paragraph 63), remains exogenous, with the stock determined by perpetual inventory.

36 Current price magnitudes are obtained by straightforward application of the relevant price deflators.

Consumers' expenditure

At constant prices

Non-durable items, total

$$CND = 1663.0 + 0.17162 \; (\frac{YD-YJG}{PCND}) + 0.6 \; (\frac{YJG}{PCND})$$
$$(6.7)$$

$$+ \; 0.3 \; (\frac{YJG}{PCND})_{-1} + 0.1 \; (\frac{YJG}{PCND})_{-2}$$

$$+ \; 0.50956 \left[CND_{-1} - \left(0.6(\frac{YJG}{PCND})_{-1} + 0.3(\frac{YJG}{PCND})_{-2} + 0.1(\frac{YJG}{PCND})_{-3} \right) \right]$$
$$(6.4)$$

$$+ \; 0.07109 \; (\frac{NLAJ_{-1}}{PCND}) - 0.07109 \; (0.50956) \; (\frac{NLAJ_{-2}}{PCND_{-1}})$$
$$(12.5)$$

$$+ \; 316.22 \; D731 + 72.166 \; D681 - 225.76 \; D681_{-1} - 0.39596 \; u_{-1}$$
$$(4.5) \qquad\quad (1.0) \qquad\qquad (3.1) \qquad\qquad\quad (2.7)$$

$$\bar{R}^2 = 0.987 \qquad SE = 68.1 \qquad 1964 \; I - 1978 \; II$$

Beer

$$\frac{CB}{CND} = 0.02519 + 0.00019 TIME + 0.00498 \frac{PB}{PCND} - 0.00737 \; \frac{CND-CND_{-5}}{5}$$
$$(3.8) \qquad (13.8) \qquad\qquad (0.9) \qquad\qquad (0.8) \qquad\qquad 0.2 \sum_{i=1} CND_{-i}$$

$$\bar{R}^2 = 0.839 \qquad SE = 0.0013 \qquad DW = 1.9 \qquad 1964 \; II - 1978 \; II$$

Wines and spirits

$$\frac{CWS}{CND} = 0.06897 + 0.0001 \; TIME - 0.03883 \frac{PWS}{PCND}$$
$$(9.8) \qquad (2.6) \qquad\qquad (8.8)$$

$$\bar{R}^2 = 0.94 \qquad SE = 0.00165 \qquad DW = 1.1 \qquad 1963 \; I \; - 1978 \; II$$

Tobacco

$$*\frac{CT}{CND} = 0.08797 - 0.000325 TIME - 0.01431 \frac{PT}{PCND} - 0.01356 \; \frac{CND-CND_{-5}}{5}$$
$$(21.7) \qquad (19.4) \qquad\qquad (5.2) \qquad\qquad (1.6) \qquad\qquad 0.2 \sum_{i=1} CND_{-i}$$

$$\bar{R}^2 = 0.95 \qquad SE = 0.001 \qquad DW = 1.1 \qquad 1963 \; II - 1977 \; IV$$

Durable goods

$$CD = 0.07981 \; YCDL - 169.12 - 10.455 \; RMD + 0.02572 \; (\frac{NLAJ_{-1}}{PCD})$$
$$(2.8) \qquad\qquad (1.5) \qquad (8.3) \qquad\qquad (7.9)$$

$$- \; 0.05351 \; (\frac{SCD\pounds_{-1}}{PCD}) + 0.43387 \; (\frac{LZNA}{PCD})$$
$$(2.3) \qquad\qquad (6.1)$$

$$\bar{R}^2 = 0.921 \qquad SE = 61.5 \qquad DW = 1.6 \qquad 1963 \; II - 1978 \; II$$

Total

$$C = CND + CD$$

Stock of durable consumption

$$SCD = 0.9409 \ SCD_{-1} + 0.96891 \ CD$$

Stock of consumers' expenditure on cars and motor-cycles

$$KMV = CMV + \underset{(470.9)}{0.98301} \ KMV_{-1} + \underset{(50.4)}{0.98696} \ u_{-1}$$

$$\bar{R}^2 = 0.99 \qquad SE = 2.5 \qquad 1965 \ II - 1978 \ II$$

At current prices

CND£ = CND.PCND

CD£ = CD.PCD

C£   = CND£ + CD£

SCD£ = SCD.PCD

Fixed investment

37 Private non-residential fixed investment is divided into six categories.   Four of these are modelled by fairly conventional accelerator equations, which have been estimated. Thus, the equation for plant and machinery investment by manufacturing industry contains a lagged capital stock term to capture replacement investment, and terms in the change in output lagged up to thirteen quarters - the core of the accelerator approach. The parallel equation for the distribution and service industries is of similar structure, while for industrial buildings the capital stock term is dropped, and for vehicles it is replaced by a distributed lag of earlier investment, which aims to pick up the replacement cycle peculiar to vehicles.

38 These equations for industrial investment contain no financial variables.   However, research has been in progress for some time in an effort to identify and incorporate any such influences.   This work, following on from that by Flemming et al (1976a and b), has not been entirely fruitless.   For example, the valuation ratio - the ratio of the rate of return to the cost of capital - has demonstrated a significant, albeit not very robust, relationship to investment.   This was perhaps to be expected, given the established significance of the accelerator and the quite strong correlation between output and profitability.   However, no equations that are obviously superior to existing ones have yet been found, so that, for the time being, the model remains formally accelerator-based.   In forecasting, however, careful attention is given to financial factors as well, and, especially

when judging the outlook for the immediate future, heed is also paid to information from surveys of investment intentions.

39   Private residential investment is modelled by an estimated equation in which investment reacts positively over a period of time to movements in the price of new houses relative to proxied building costs, which include the cost of borrowing.

40 Within private investment, shipping and a residual category which includes investment in the North Sea, are exogenous.   Public sector fixed investment, both residential and non-residential, is also exogenous.

41 Various categories of current price investment follow by applying the relevant deflators.   Then total private sector investment is split between the personal and company sectors by a simple equation.

Fixed investment

At constant prices

Private: plant and machinery in manufacturing industry

$$IPMM = 423.91 + 0.00996 \; KPMM_{-1} + \sum_{i=0}^{13} A_i \; \Delta PROM_{-i} + 0.61517 \; u_{-1}$$
$$\quad\quad\;\; (3.7) \quad\quad (2.1) \quad\quad\quad\quad\quad\quad\quad\quad\quad\quad (5.0)$$

$A_{0-13} = $ 0; 0; 2.286; 3.501; 4.461; 5.165; 5.613; 5.806; 5.743; 5.425;
$\quad\quad\quad\quad\quad$ (1.1) (1.9) (2.4) (2.7) (2.7) (2.7) (2.6) (2.6)

$\quad\quad\quad\quad$ 4.851; 4.022; 2.937; 1.596 $\quad \sum A_i = 51.405$
$\quad\quad\quad\quad$ (2.5) (2.5) (2.5) (2.4)

$\quad\quad \bar{R}^2 = 0.564 \quad\quad\quad SE = 34.8 \quad\quad\quad 1966 \; IV - 1978 \; II$

$KPMM = IPMM + 0.98 \; KPMM_{-1}$

Private: plant and machinery in distribution and service industries

$$IPMD = 0.03892 \; KPMD_{-1} + \sum_{i=0}^{14} A_i \; \Delta OOTH_{-i} + 0.15683 \; u_{-1}$$
$$\quad\quad (56.4) \quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad (1.1)$$

$A_{0-14} = $ 0.0414; 0.0523; 0.0612; 0.0682; 0.0732; 0.0763; 0.0775; 0.0767
$\quad\quad\quad\quad$ (3.0) (4.7) (6.9) (9.1) (10.5) (·10.9) (10.5) (10.0)

$\quad\quad\quad\quad$ 0.0739; 0.0692; 0.0625; 0.0539; 0.0434; 0.0309; 0.0164
$\quad\quad\quad\quad$ (9.4) (8.9) (8.4) (8.1) (7.8) (7.5) (7.3)

$\quad\quad \sum A_i = 0.8770$

$\quad\quad \bar{R}^2 = 0.94 \quad\quad\quad SE = 22.2 \quad\quad\quad 1967 \; I - 1978 \; II$

$KPMD = IPMD + 0.98 \; KPMD_{-1}$

Private: industrial buildings

$$IB = 504.71 + \sum_{i=o}^{15} A_i \Delta GDP_{-i} + 0.87965\ u_{-1}$$
$$(12.1) \phantom{+ \sum_{i=o}^{15} A_i \Delta GDP_{-i} +}(10.0)$$

A_{0-15}= 0.0258; 0.0401; 0.0522; 0.0623; 0.0702; 0.0760; 0.0797; 0.0813;
$\phantom{A_{0-15}=}$ (2.1)   (2.9)   (3.1)   (3.1)   (3.1)   (3.1)   (3.0)   (3.0)

$\phantom{A_{0-15}=}$ 0.0807; 0.0781; 0.0733; 0.0664; 0.0573; 0.0462; 0.0329; 0.0175
$\phantom{A_{0-15}=}$ (3.0)   (2.9)   (2.9)   (2.9)   (2.9)   (2.9)   (2.9)   (2.8)

$\sum A_i$ = 0.9399
(3.1)

$\bar{R}^2$ = 0.894   SE = 26.3   1967 II - 1978 II

Private: vehicles

$$*IVEH = \sum_{i=o}^{16} A_i \Delta GDP_{-i} + \sum_{i=8}^{19} B_i\ IVEH_{-i}$$

A_{0-16}= 0.0293; 0.0350; 0.0388; 0.0409; 0.0414; 0.0406; 0.0388;
$\phantom{A_{0-16}=}$ (4.0)   (6.4)   (8.8)   (9.7)   (9.5)   (8.9)   (8.2)

$\phantom{A_{0-16}=}$ 0.0359; 0.0323; 0.0282; 0.0238; 0.0193; 0.0147; 0.0105;
$\phantom{A_{0-16}=}$ (7.7)   (7.3)   (7.0)   (6.7)   (6.5)   (6.3)   (6.1)

$\phantom{A_{0-16}=}$ 0.0067; 0.0036; 0.0013 $\sum A_i$ = 0.4412
$\phantom{A_{0-16}=}$ (6.0)   (5.9)   (5.8) (9.5)

B_{8-19}= 0.0459; 0.0790; 0.1002; 0.1110; 0.1126; 0.1067; 0.0947
$\phantom{B_{8-19}=}$ (1.3)   (1.7)   (2.5)   (4.6)   (18.9)   (7.6)   (3.4)

$\phantom{B_{8-19}=}$ 0.0784; 0.0596; 0.0403; 0.0225; 0.0083 $\sum B_i$ = 0.8591
$\phantom{B_{8-19}=}$ (2.2)   (1.7)   (1.3)   (1.1)   (1.0) (23.8)

$\bar{R}^2$ = 0.674   SE = 18.9   DW = 2.0   1965 I - 1976 III

Private: fixed residential

$$\ln IHP = 7.8692 + \sum_{i=4}^{12} A_i \ln \left[\frac{PNH}{0.444\ PIMN + 0.556\ ULC} \right]_{-i}$$
$$(64.7)$$
$$+ \sum_{i=0}^{8} B_i \ln \left[1 + \frac{RCBR + 2}{100} \right]_{-i}$$

A_{4-12} = 0.2294; 0.2387; 0.2393; 0.2313; 0.2145; 0.1890; 0.1548;
$\phantom{A_{4-12} =}$ (4.4)   (7.1)   (10.3)   (10.5)   (8.5)   (7.0)   (5.9)

$\phantom{A_{4-12} =}$ 0.1119; 0.0603 $\sum A_i$ = 1.6692
$\phantom{A_{4-12} =}$ (5.2)   (4.7) (11.1)

B_{0-8} = -2.202; -2.421; -2.524; -2.511; -2.382; -2.138; -1.777;
$\phantom{B_{0-8} =}$ (6.2)   (9.6)   (12.5)   (12.7)   (11.4)   (10.0)   (9.0)

$\phantom{B_{0-8} =}$ -1.301; -0.708 $\sum B_i$ = -17.962
$\phantom{B_{0-8} =}$ (8.2)   (7.6) (12.8)

$\bar{R}^2$ = 0.817   SE = 0.058   DW = 1.3   1968 II - 1978 II

Private: aggregation

 INP = IPMM + IPMD + IB + IVEH + INS + IRES

 IFP = INP + IHP

Public

 IFG = ING + IHG

Total

 IF = IFP + IFG

At current prices

   INP£ = IPMM.PPMM + IPMD.PPMD + (IB + IVEH).PVIB + INS.PINS + IRES.PIRS

   IHP£ = IHP.PIHP

   IFP£ = INP£ + IHP£

   IFG£ = IFG.PIFG

   IF£ = IFP£ + IFG£

Allocation within private sector

 Personal sector

 IFJ£ = 32.29373 + 0.79186 IHP£ + 0.13711 INP£ + 0.73975 u_{-1}
        (0.9)   (5.0)   (5.3)   (8.0)

    $\bar{R}^2$ = 0.982   SE = 35.1   1963 II - 1978 II

 Company sector

 IFC£ = IFP£ - IFJ£

Stockbuilding, stock levels, and stock appreciation

42 Stocks are modelled by two stages of disaggregation.   First,
three categories are identified: these are - finished goods in total;
basic materials, fuels and work in progress; and all other stocks.
Then, stocks of finished goods are allocated among wholesalers, retailers
and manufacturing industry.

43 Stocks of finished goods in aggregate are modelled from an
inflows-minus-outflows approach.   Inflows to stocks are postulated as
a function of orders and of the deviation of output from trend, and
outflows from stocks as a function of demand.   Orders, in turn, are
related non-linearly to trend demand, the deviation of stocks from
some desired level, and financial factors.   The reduced form is an
equation relating stockbuilding non-linearly to the deviations of
demand, output and profits from their respective trends, and to the
gap between the actual and trend stock-output ratios.   In addition, the
change in the exchange rate enters to account for certain speculative
activity, and there is a dummy relating to three-day working in 1974.

44   Stocks of basic materials and fuels, and work in progress, in manufacturing, are taken together and modelled by much the same approach. Industrial output replaces final expenditure as the main demand-side variable, and relevant categories of imports form part of the supply side.   The real interest rate enters as an additional variable, while the exchange rate drops out on the basis of the empirical evidence.

45   Other stocks comprise those of industries other than manufacturing and distribution.   They are determined by a simple partial adjustment model, with the stock moving towards a desired level which is proxied by a constant proportion of GDP.

46   Wholesalers and retailers are assumed, as a convenient approximation, to hold stocks of finished goods only.   Stockbuilding by wholesalers is a function of final sales, the existing stock level, real interest rates and time. That by retailers is a function of consumers' expenditure, real interest rates and time, and there is a dummy to represent the pre-Budget surge in consumer demand in 1973.   Stockbuilding of finished goods by manufacturing industry follows by identity.

47   Book value is the current price value of the total stock level, and stock appreciation is the change in book value attributable to price movements.   Simple rules of thumb allocate stock appreciation amongst sectors.

48   Total current price stockbuilding is the change in current price book value less stock appreciation, and is allocated amongst the three domestic sectors by straightforward equations, with the public sector as the residual.

49   Stockbuilding is a problem area in most models.   The present one is no exception: the tracking record of these equations is not good, and further work in this area is needed.

Stockbuilding, stock levels and stock appreciation (including work in progress

At constant prices

Finished goods

$$KIIF = KIIF_{-1} + IIF$$

$$IIF = 0.05921\ CEF^* + 0.02555(MPRO-MPRO^*) - 0.05556(EF-II)$$
$$\qquad (1.5) \qquad\qquad (3.1) \qquad\qquad\qquad (1.4)$$

$$+\ 0.07172\ \Delta\ EER(EF-II)$$
$$(3.9)$$

$$+\ 0.00745\ CEF^*\ (-D741+0.75D741_{-1}+0.25\ D741_{-2})$$
$$(3.4)$$

$$+\ 0.12347\ CEF^* \left[\frac{YCTP_{-1} + RESE_{-1}}{YCR^*}\right] \cdot \left[\frac{0.3\ CEF^*_{-1} - KIIF_{-2}}{EF-II}\right]$$

where:

$$CEF^* = \left[\sum_{i=0}^{7}\ 0.95^i\ (EF-II)_{-i}\right] / \sum_{i=0}^{7}\ 0.95^i$$

$$MPRO^* = \left[\sum_{i=0}^{7}\ 0.95^i\ MPRO_{-i}\right] / \sum_{i=0}^{7}\ 0.95^i$$

$$YCR^* = \left[\sum_{i=0}^{7}\ 0.95^i\ (YCTP_{-1} + RESE_{-1})_{-i}\right] / \sum_{i=0}^{7}\ 0.95^i$$

Basic materials, fuels and work in progress

$$KIIB = KIIB_{-1} + IIB$$

$$IIB = 0.58506\ MPRO^* + 0.15545\ (MG2+MGIM-MGZ^*) + 0.5729\ MPRO$$
$$(4.4) \qquad\qquad (1.0) \qquad\qquad\qquad\qquad (4.5)$$

$$-\ 0.26935\ MPRO^* \left[\frac{MPRO}{MPRO^*} - \frac{MPRO_{-1}}{MPRO^*_{-1}}\right]$$

$$+\ 0.00602\ MPRO^* \cdot (-D741+0.75\ D741_{-1}+0.25\ D741_{-2})$$
$$(0.3)$$

$$-\ 0.12077\ MPRO^* \left[\frac{1+0.01\ RLA}{1+0.01\ R^*} - \left\{\frac{1+0.01\ RLA}{1+0.01\ R^*}\right\}_{-1}\right]$$
$$(0.8)$$

$$+\ 0.04831\ MPRO^* \left[\frac{YCTP_{-1}+RESE_{-1}}{YCR^*}\right]\left[2.432-\frac{KIIB_{-2}}{MPRO^*_{-1}}\right]$$

$$\overline{R}^2 = 0.522 \qquad SE = 122.2 \qquad DW = 1.7 \qquad 1965\ I-1978\ II$$

where MPRO* AND YCR* are as defined above, and

$$MGZ^* = \left[\sum_{i=0}^{7}\ 0.95^i\ (MG2 + MGIM)_{-i}\right] / \sum_{i=0}^{7}\ 0.95^i$$

$$R^* = 100 \left[\frac{0.7\ (WS - WS_{-4})}{WS_{-4}} + \frac{0.3\ (PM - PM_{-4})}{PM_{-4}}\right]$$

Other stocks

$$KIIO = 0.04416\ GDP + 0.84718\ KIIO_{-1}$$
$$(3.3) \qquad\qquad (17.4)$$

$$\overline{R}^2 = 0.972 \qquad SE = 89.6 \qquad 1968\ I-1978\ II$$

$$IIO = \Delta\ KIIO$$

Wholesalers' stocks

$$*KIIW = KIIW_{-1} + 630.0 - \underset{(3.4)}{0.35143} KIIW_{-1}$$
$$\phantom{*KIIW = KIIW_{-1}} \underset{(2.8)}{}$$

$$- \underset{(0.1)}{0.00128}(EF-II) - \underset{(2.1)}{5.2329} \left[RLA - 100 \left\{ \frac{PEF - PEF_{-4}}{PEF_{-4}} \right\} \right]$$

$$+ \underset{(2.5)}{10.50636} \; TIME$$

$$IIW = \Delta \; KIIW$$

Retailers' stocks

$$*KIIR = KIIR_{-1} - \underset{(2.5)}{403.32} + \underset{(2.8)}{0.04882C}$$

$$- \underset{(0.1)}{0.07198} \left[RLA - 100 \left(\frac{PEF - PEF_{-4}}{PEF_{-4}} \right) \right]$$

$$- \underset{(2.9)}{4.5850} \; TIME + \underset{(7.8)}{290.43} \; D732$$

$$\overline{R}^2 = 0.707 \quad SE = 34.6 \quad DW = 2.05 \quad 1964 \; II{-}1973 \; IV$$

$$IIR = \Delta \; KIIR$$

Stocks of finished goods of manufacturing industry

$$IIFM = IIF - IIW - IIR$$

$$KIFM = KIFM_{-1} + IIFM$$

Total stocks of manufacturing industry

$$IIM = IIFM + IIB$$

$$KIIM = KIIM_{-1} + IIM$$

Total stocks

$$II = IIF + IIB + IIO$$

$$KIIT = KIIM + KIIW + KIIR + KIIO$$

At current prices

Book value

$$BV = PS.KIIT$$

Stock appreciation:

$$\text{total} \quad YSA = BV_{-1} \left[\frac{PS}{PS_{-1}} - 1 \right]$$

company sector $YSAC = 0.8 \; YSA$

public sector $YSAG = 0.07 \; YSA$

personal sector $YSAJ = YSA - YSAC - YSAG$

Stockbuilding

total II₤ = Λ BV − YSA

personal sector IIJ₤ = 27.114 + 0.0855 II₤ + 0.55096 TIME
                            (2.6)   (11.2)   (3.1)

                    + 0.5292 u_{-1}
                      (**4**.1)

$\overline{R}^2$ = 0.695   SE = 7.23   1963 II–1974 IV

company sector IIC₤ = 38.968 + 0.9544 II₤ − 1.0942 TIME
                          (1.6)   (40.5)   (3.0)

                    + 0.25068 u_{-1}
                      (1.9)

$\overline{R}^2$ = 0.973   SE = 39.3   1963 II–1978 II

public sector IIG₤ = II₤ − IIJ₤ − IIC₤

Exports of goods and services

50 Seven categories of exported goods, on an overseas trade statistics
(OTS) basis, and three of exported services are identified.

51 By virtue of their large share in total exports, the equation for
manufactures is the most important.   Various specifications have
been tested, mostly single equations that are reduced forms embodying
both demand and supply influences.   A full discussion has been provided
by Enoch (1978).   The equation at present in the model relates exports
to UK-weighted world trade – clearly a demand factor – and to labour
cost competitiveness, which can be seen as embracing both supply and
demand mechanisms, with the effect being spread over seventeen quarters.
Dummies to take account of dock strikes are incorporated and a quadratic
time trend – negative but attentuating – has been found to improve the
fit, possibly capturing the structural decline in the importance of
Commonwealth markets.

52 Exports of food, drink and tobacco are related to agricultural
production over the preceding two years and to a positive time trend.
Exports of basic materials depend on world activity (as measured by
UK trade-weighted industrial production of the OECD area) and on the
prices of exports of non-manufactures relative to wholesale prices – a
supply-side effect, having a positive sign, but working only after a
substantial lag.   Both these equations contain dummies for dock strikes.

53 Ships, aircraft, North Sea installations and miscellaneous (SITC, section 9) exports is a heterogeneous category and is related to the size of UK export markets, together with a negative time trend and dummies for particular events.

54 Exports of North Sea oil are a function of North Sea production and of net UK demand for oil. Exports of other fuel - e.g. products processed in the United Kingdom - depend on the level of fuel imports and the relative price of imported fuel. Exports of precious stones are exogenous.

55 Exports of goods on a balance of payments basis are related to the OTS components by a straightforward linking equation.

56 Exports of government services are specified as constant, with the residual accommodating any variation. Those of shipping are related to world activity and a negative time trend; those of all other services are related to world trade and lagged price competitiveness.

57 Exports at current prices follow by applying appropriate price indices after some aggregation.

Exports of goods and services

At constant prices

Manufactures

$$\ln XGMA = 0.75241 \ln WTX - 0.15701 \; D674 - 0.60369 \; \ln NULE$$
$$ (5.7) (5.2) (2.9)$$
$$- .12775 \; D72A + .0764 \; D72A_{-1} + 8.1294 - .01227 \; TIME$$
$$ (4.4) (2.7) \phantom{D72A_{-1} + } (6.3) (2.2)$$
$$+ .00006 \; TIME^2$$
$$ (2.4)$$

$\overline{R}^2 = 0.986$ SE = 0.027   DW = 1.9   1965 I-1978 I

where the index of 'effective' labour cost competitiveness is defined thus:

$$NULE = \exp\left[\left(\sum_{i=0}^{16} A_i \ln NULC_{-i} \right) / (-0.6037) \right]$$

A_{0-16} = -0.0418; -0.0438; -0.0452; -0.0461; -0.0465; -0.0462;
$\phantom{A_{0-16} = }$ (1.5)   (1.8)   (2.0)   (2.3)   (2.5)   (2.6)

$\phantom{A_{0-16} = }$ -0.0455; -0.0441; -0.0422; -0.0397; -0.0367; -0.0332;
$\phantom{A_{0-16} = }$ (2.6)   (2.6)   (2.6)   (2.5)   (2.5)   (2.4)

$\phantom{A_{0-16} = }$ -0.0290; -0.0243; -0.0191; -0.0133; -0.0069
$\phantom{A_{0-16} = }$ (2.3)   (2.3)   (2.2)   (2.1)   (2.1)

$\sum A_i$ = -0.6037
 (2.6)

Food, drink and tobacco

$$\ln XGFD = 4.3919 + 0.01755 \text{ TIME} - 0.27392 \text{ D72A} - 0.1411 \text{ D674}$$
$$(56.2) \quad (16.2) \qquad\qquad (3.8) \qquad\qquad (1.9)$$
$$+ \sum_{i=0}^{8} A_i \ln AG_{-i}$$

$A_{0-8} = 0.0306;\quad 0.0396;\quad 0.0454;\quad 0.0482;\quad 0.0479;\quad 0.0445;\quad 0.0380;$
$\qquad\quad (0.3) \qquad (0.7) \qquad (1.3) \qquad (1.5) \qquad (1.2) \qquad (1.0) \qquad (0.9)$

$\qquad\quad 0.0284;\quad 0.0157 \qquad\qquad \Sigma A_i = 0.338$
$\qquad\quad (0.8) \qquad (0.7) \qquad\qquad\qquad\qquad (1.5)$

$\overline{R}^2 = 0.943 \qquad SE = 0.071 \qquad DW = 2.3 \qquad 1965\ I{-}1977\ IV$

Basic materials

$$\ln XGBM = 1.0801 \ \ln TWIP - 0.15317 \text{ D72A} - 0.17108 \text{ D674}$$
$$(536.8) \qquad\qquad (2.7) \qquad\qquad (2.9)$$
$$- 0.10467 (D70A_{-1} - D70A_{-2}) + \sum_{i=8}^{16} A_i \ln\left[\frac{PXNM}{PIMO}\right]_{-i}$$
$$(2.6)$$

$A_{8-16} = 0.090;\quad 0.130;\quad 0.157;\quad 0.171;\quad 0.174;\quad 0.164;\quad 0.141;$
$\qquad\quad (0.9) \qquad (2.0) \qquad (4.1) \qquad (6.1) \qquad (5.4) \qquad (4.4) \qquad (3.7)$

$\qquad\quad 0.107;\quad 0.060 \qquad\qquad \Sigma A_i = 1.194$
$\qquad\quad (3.3) \qquad (3.0) \qquad\qquad\qquad\qquad (5.7)$

$\overline{R}^2 = 0.873 \qquad SE = 0.056 \qquad DW = 1.6 \qquad 1967\ I{-}1978\ II$

Ships, aircraft, North Sea installations and SITC section 9

$$\ln XGA1 = 2.0321 - 0.0072 \text{ TIME} + 0.96003 \ \ln WTX$$
$$(3.0) \qquad (1.3) \qquad\qquad (4.0)$$
$$- 0.32814 \text{ D71A} + 0.29386 \text{ D773}$$
$$(3.7) \qquad\qquad (3.2)$$

$\overline{R}^2 = 0.898 \qquad SE = 0.087 \qquad DW = 1.8 \qquad 1963\ I{-}1978\ I$

Fuel other than North Sea oil

$$\ln XG2A = -1.8369 + 0.50881 \ \ln MG2 + 0.5509 \ \ln MG2_{-1}$$
$$(2.2) \qquad (2.0) \qquad\qquad (2.2)$$
$$+ \sum_{i=2}^{12} A_i \ln\left[\frac{PFL}{PGDP}\right]_{-i}$$

$A_{2-12} = 0.0172;\quad 0.0293;\quad 0.0387;\quad 0.0453;\quad 0.0492;\quad 0.0503;\quad 0.0488;$
$\qquad\quad (0.7) \qquad (1.7) \qquad (1.9) \qquad (1.6) \qquad (1.4) \qquad (1.3) \qquad (1.2)$

$\qquad\quad 0.0445;\quad 0.0374;\quad 0.0277;\quad 0.0152 \qquad\qquad \Sigma A_i = 0.4035$
$\qquad\quad (1.2) \qquad (1.1) \qquad (1.1) \qquad (1.1)$

$\overline{R}^2 = 0.68 \qquad SE = 0.091 \qquad DW = 1.9 \qquad 1966\ I{-}1975\ II$

North Sea oil

$$\ln XG2B = 0.48693 + 1.14347 \ \ln (40.5\ NSO) - 0.38385 \ \ln NDG2$$

Total fuel

$$XG2 = XG2A + XG2B$$

Total non-manufactures other than fuel

$$XGNO = XGFD + XGBM + XGAI + XGPS$$

Total goods

$$\ln XG = 0.15106 + 0.97866 \ln(XGMA+XGNO+XG2) + 0.42496 \ U_{-1}$$
$$(1.8) \qquad (95.5) \qquad\qquad\qquad (3.6)$$

$\overline{R}^2 = 0.997 \qquad SE = 0.013 \qquad 1963 \ II-1978 \ IV$

Government services

$$XSGS = 24.16$$

Shipping

$$\ln XSSH = 0.85048 \ \ln XSSH_{-1} - 0.90313 + 0.48275 \ \ln TWIP$$
$$(15.0) \qquad\qquad\quad (2.7) \qquad (3.9)$$

$$- 0.00457 \ TIME$$
$$(3.9)$$

$\overline{R}^2 = 0.98 \qquad SE = 0.031 \qquad 1963 \ II-1978 \ II$

Travel, civil aviation and 'other'

$$\ln XSTC = 0.72909 \ \ln XSTC_{-1} - 0.25015 + 0.18683 \ \ln WTX$$
$$(7.4) \qquad\qquad\quad (0.7) \qquad (2.7)$$

$$+ \sum_{i=6}^{12} A_i \ \ln \left[\frac{PXS}{PCOM.ERUK} \right]_{-i}$$

A_{6-12} = -0.0127;   -0.0351;   -0.0494;   -0.0557;   -0.0539;   -0.0440
        (0.2)   (1.1)   (2.1)   (1.8)   (1.5)   (1.3)

        -0.0260 $\sum A_i = 0.2768$
        (1.2)   (2.1)

$\overline{R}^2 = 0.993 \qquad SE = 0.021 \qquad 1966 \ I-1978 \ II$

Total services

$$XS = XSSH + XSTC + XSGS$$

Total goods and services

$$X = XG + XS$$

At current prices

$$XPP£ = 0.9 \ XG2A.PX2A + XG2B.PX2B$$

$$XG2£ = PXG2.XG2$$

$$XG£ = XG.PXG$$

$$XS£ = XS.PXS$$

$$X£ = XG£ + XS£$$

Imports of goods and services

58 Imports are divided into seven categories of goods (OTS basis) and one of services.

59 Imports of food, drink and tobacco are related to consumers' expenditure on non-durables, to agricultural production and to the prices of food, drink and tobacco relative to those of other non-durables. Imports of industrial materials are related to the industrial production, relevant stockbuilding and the import price of industrial materials relative to domestic wholesale prices; there is also a positive time trend.

60 Imports of finished manufactures follow directly as the difference between demand for such goods, both in final sales and for stock, and gross domestic production thereof (see paragraphs 69-70).

61 Of the four other categories of imported goods, fuel is discussed below, while the other three - precious stones, North Sea production equipment, and ships, aircraft and other items not specified elsewhere - are exogenous. A simple equation links the sum of OTS items to total imports on a balance of payments basis.

62 Imports of services are modelled in aggregate, disaggregation having failed to improve the overall fit. They are related to consumer spending on non-durables and to their price relative to other domestic prices.

63 Imports of fuel are derived within a small sub-system of equations which takes account of demand and supply factors. Consumption of motor spirit is determined by overall economic activity, by the price of petrol relative to consumer prices more generally, and by the stock of vehicles; some dummy variables also help explain the past. Consumption of other petroleum products is related also to activity, as well as to unseasonal temperature, to the price of oil relative to coal and to the price of fuel (proxied here by coal) relative to the general price level. These two elements of consumption are then combined and used, in conjunction with dummies representing periods of physical shortages of oil, to model the net demand for oil. Given North Sea production, and assuming that net imports of fuel other than oil are negligible, net imports of fuel are derived. With gross exports of fuel already

modelled (paragraph 54), gross imports follow, after adjustment for the superior quality of North Sea oil.

64   Imports at current prices follow in the usual way.

Imports of goods and services

At constant prices

Food, drink and tobacco

$$\ln MGFD = 0.73086 \ln CND + \sum_{i=1}^{4} A_i \ln AG_{-i} + \sum_{i=0}^{7} B_i \ln\left[\frac{PFDT}{PCND}\right]_{-i}$$
$$\qquad\quad (840.9)$$

$$A_{1-4} = -0.0575; \; -0.1278; \; -0.1417; \; -0.0991. \quad \Sigma A_i = -0.4261$$
$$\qquad\quad (0.5) \qquad (4.1) \qquad (2.3) \qquad (1.7) \qquad\qquad (4.1)$$

$$B_{0-7} = -0.0257; \; -0.0289; \; -0.0303; \; -0.0299; \; -0.0276; \; -0.0234;$$
$$\qquad\quad (0.5) \qquad (0.9) \qquad (2.2) \qquad (2.1) \qquad (1.3) \qquad (1.0)$$

$$\qquad\quad -0.0175; \; -0.0097. \quad \Sigma B_i = -0.193$$
$$\qquad\qquad (0.8) \qquad (0.7) \qquad\qquad (2.5)$$

$\bar{R}^2 = 0.196$ $\qquad\qquad$ SE = 0.035 $\qquad$ DW = 2.4 $\qquad$ 1969 I - 1978 II

Industrial materials

$$\ln MGIM = \sum_{i=2}^{12} A_i \ln\left[\frac{UMIM}{PIMO}\right]_{-i} + 0.79380 \ln MPRO + 0.85603 \; \frac{IIB}{MPRO}$$
$$\qquad\qquad\qquad\qquad\qquad\qquad\quad (140.9) \qquad\qquad (3.8)$$

$$\qquad\quad + 0.00765 \; TIME$$
$$\qquad\qquad (12.8)$$

$$A_{2-12} = -0.0066; \; -0.0103; \; -0.0131; \; -0.0150; \; -0.0161; \; -0.0164;$$
$$\qquad\quad (0.3) \qquad (0.5) \qquad (0.8) \qquad (1.1) \qquad (1.3) \qquad (1.2)$$

$$\qquad\quad -0.0158; \; -0.0143; \; -0.0120; \; -0.0088; \; -0.0049. \; \Sigma A_i = -0.1332$$
$$\qquad\quad (1.2) \qquad (1.1) \qquad (1.1) \qquad (1.0) \qquad (1.0) \qquad\qquad (1.0)$$

$\bar{R}^2 = 0.999$ $\qquad\qquad$ SE = 0.035 $\qquad$ DW = 2.1 $\qquad$ 1966 I - 1978 II

Finished manufactures

MGFM   = MND + IIFM -1.67 MPRM

Total goods (balance of payments basis)

$$\ln MG = -0.13828 + 1.00637 \ln (MGFD + MG2 + MGIM + MGFM + MGA1$$
$$\qquad\quad (1.3) \qquad (81.5)$$

$$\qquad\quad + MGPS + MGNS) + 0.47507u_{-1}$$
$$\qquad\qquad\qquad\qquad\qquad (3.3)$$

$\bar{R}^2 = 0.998$ $\qquad\qquad$ SE = 0.0110 $\qquad$ 1963 II - 1978 II

Services

$$\ln MS = -12.240 + 1.3043 \ln CND + 0.74099 \ln CND_{-1}$$
$$\qquad\quad (10.8) \qquad (3.5) \qquad\qquad (2.0)$$

$$\qquad\quad -0.39848 \ln \frac{PMS}{PGDP} + 0.57593u_{-1}$$
$$\qquad\qquad (3.2) \qquad\qquad (5.1)$$

$\bar{R}^2 = 0.965$ $\qquad\qquad$ SE = 0.029 $\qquad$ 1963 III - 1978 II

Total goods and services

$$M = MG + MS$$

Goods, other than fuel, as percentage of weighted final expenditure

$$MPWE = \frac{100(M-MG2)}{(0.179\ C + 0.092\ G + 0.219\ IF + 0.377\ II + 0.202X).\ \dfrac{36272}{6345}}$$

Derivation of fuel imports (MG2)

Net demand for oil

$$NDG2 = \underset{(2.1)}{-145.41} + \underset{(3.4)}{39.892}\ \frac{PETR}{1000} + \underset{(1.1)}{12.473}\ \frac{PETR_{-1}}{1000}$$

$$+ \underset{(1.5)}{20.230}\ (-D72B - 2D72B_{-1} - 2D72B_{-2} - D72B_{-3} + D72B_{-5}$$

$$+ 2D72B_{-6} + 2D72B_{-7} + D72B_{-8})$$

$$\bar{R}^2 = 0.833 \qquad SE = 59.03 \qquad DW = 1.6 \qquad 1965\ I - 1978\ II$$

Inland consumption of motor spirit

$$*\ln DPPM = \underset{(4.0)}{-5.0583} + \underset{(6.9)}{1.0465}\ \ln GDP + \sum_{i=o}^{4} A_i \ln \left[\frac{PFLI}{PCND}\right]_{-i}$$

$$+ \underset{(6.6)}{0.28537}\ \ln \frac{(KMV + KMV_{-1})}{2} + \underset{(3.0)}{0.02343}\ (D681 - D681_{-1})$$

$$+ \underset{(3.8)}{0.04538}\ D721 + \underset{(3.8)}{0.02959}\ D744 - \underset{(0.1)}{0.00174}\ D741$$

$$A_{0-4} = \underset{(4.4)}{-0.0905};\ \underset{(9.9)}{-0.0515};\ \underset{(2.6)}{-0.0256};\ \underset{(1.1)}{-0.0102};\ \underset{(0.6)}{-0.0025}.\ \ \Sigma A_i = \underset{(9.9)}{-0.1804}$$

$$\bar{R}^2 = 0.990 \qquad SE = 0.011 \qquad DW = 1.02 \qquad 1967\ II - 1976\ II$$

Inland consumption of other petroleum products

$$*\ln DPPO = -12.238 + \underset{(18.3)}{2.1539}\ \ln GDP + \sum_{i=o}^{4} A_i \ln \left[\frac{PFLO}{PCL}\right]_{-i}$$

$$+ \sum_{i=o}^{15} B_i \ln \frac{PCL}{PGDP}_{-i} - \underset{(3.9)}{0.04099}\ Q1.TEMP - \underset{(1.4)}{0.0248}\ Q2.TEMP$$

$$- \underset{(0.7)}{0.00874}\ Q3.TEMP - \underset{(0.5)}{0.0118}\ Q4\ TEMP + \underset{(5.5)}{0.14464}\ D721$$

$$+ \underset{(3.7)}{0.12116}\ D741$$

$$A_{0-4} = -0.0796;\ -0.0493;\ -0.0263;\ -0.0103;\ -0.0016.\ \ \Sigma A_i = -0.1671$$

$$B_{0-15} = -0.0359;\ -0.0762;\ -0.1049;\ -0.1233;\ -0.1327;\ -0.1343;$$

$$-0.1294;\ -0.1192;\ -0.1051;\ -0.0882;\ -0.0699;\ -0.0514;$$

$$-0.0339;\ -0.0188;\ -0.0073;\ -0.0006.\ \ \Sigma B_i = -1.2309$$

$$\bar{R}^2 = 0.945 \qquad SE = 0.023 \qquad DW = 2.3 \qquad 1967\ I - 1975\ IV$$

Total inland consumption of petrol

$$PETR = DPPM + DPPO$$

Net imports of fuel

$$MG2N = NDG2 - 40.5NSO$$

Gross imports of fuel

$$MG2 = MG2N - XG2 \; \frac{40.5}{37.3}$$

At current prices

$$MG2\pounds = MG2.PFL$$

$$MG\pounds = MG.PMG$$

$$MS\pounds = MS.PMS$$

$$M\pounds = MG\pounds + MS\pounds$$

Imports of petroleum products

$$MPP\pounds = -76.992 + 0.95972 \; MG2\pounds$$
$$(36.4) \quad (317.95)$$

$$\bar{R}^2 = 0.999 \quad SE = 11.2 \quad DW = 1.2 \quad 1963 \; I - 1978 \; II$$

Factor cost adjustment

65 At constant prices, the factor cost adjustment which is the difference, attributable to taxes on expenditure less subsidies, between gross domestic product (GDP) measured at market prices and at factor cost, is related to the principal elements of final expenditure: the coefficient on consumers' expenditure is estimated, while those on public consumption, fixed investment and exports have been imposed on the basis of input-output statistics.

66 The factor cost adjustment at current prices is determined by quite another route, as the difference between total taxes on expenditure (see paragraphs 123-124) and subsidies (exogenous).

Factor cost adjustment

At constant prices

$\cdot$ FCA $-$ 0.04034G $-$ 0.04232IF $-$ 0.02784X $= -$ 700.67 $\quad + \quad$ 0.17139C

$$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad (5.2) \qquad\qquad (19.2)$$

$$+ \; 0.39308u_{-1}$$
$$\quad (3.0)$$

$\bar{R}^2 = 0.952 \qquad SE = 39.5 \qquad 1966 \; II - 1978 \; II$

At current prices

FCA£ $=$ TE $-$ ESAB

Ratio

TREF $=$ FCA£/FCA

Gross domestic product

67 Total final expenditure is the sum of its components.   By
subtracting imports and the factor cost adjustment, the expenditure
estimate of GDP at factor cost is reached.   The residual error and
compromise adjustment, both exogenous, are used to calculate the
income, output and average GDP series.   Only the expenditure estimate
is subsequently explicitly derived at current prices, by summation of
its current price components.

68 Aggregate income from rent is also listed in this section.
It is a function of short-term interest rates and the price deflator
for private housing investment.

Gross domestic product

At constant prices

Total final expenditure

$\quad$ EF $\qquad = C + IF + II + G + X$

Gross domestic product:

$\quad$ expenditure-based $\quad$ GDPE $= EF - M - FCA$

$\quad$ average estimate $\quad\;\;$ GDP $\;\; = GDPE - ADJ$

$\quad$ income-based $\qquad\;\;$ GDPY $= GDPE - \dfrac{RESE}{PGDP}$

$\quad$ output-based $\qquad\;\;$ GDPO $= 3GDP - GDPE - GDPY$

At current prices

Total final expenditure

$$E F£ = C£ + IF£ + II£ + G£ + X£$$

GDP, expenditure-based

$$GDP£ = EF£ - M£ - FCA£$$

Factor incomes not specified elsewhere

Aggregate income from rent

$$\Delta\ln YR = 0.0074 + 0.0027\ \Delta RLB + 0.216\ \Delta\ln PIHP$$
$$\qquad\qquad (1.7)\qquad (4.4)\qquad\qquad (3.1)$$

$$\bar{R}^2 = 0.451 \qquad SE = 0.0109 \qquad DW = 1.8 \qquad 1962\ III - 1978\ II$$

Income from rent and self-employment

$$YRSE = YR + YSE$$

Composition of output

69 Output of finished manufactures is modelled in the following way.
First a proxy for the demand for finished manufactures is obtained from
an equation which relates it to the various expenditure components of
GDP, combined in groups in which weights have been selected from input-
output data.   A second equation, estimated by instrumental variables in
order to tackle simultaneity, determines what proportion of that demand
is met from domestic gross manufacturing output (1.67 MPRM where MPRM is
net output).

70 Two adjustments are first made to the dependent variable in this
second equation: a proxy for exports of finished manufactures is
subtracted from both numerator and denominator on the assumption that all
such exports are attributable to domestic output; and stockbuilding
of finished goods by manufacturing industry is subtracted from the
numerator since demand met from stocks does not directly affect
production.   The adjusted dependent variable is related to a negative
time trend, a term which implies that there are lags in the adjustment
of domestic output to changes in demand, and competitiveness terms
giving equal weight to relative prices and relative costs.   These
competitiveness terms imply, on the one hand, that higher prices of UK
goods compared with imports, other things being equal, reduce UK
production because the demand effect, as buyers turn to imports,
outweighs the profitability effect, and, on the other, that higher UK

costs, other things being equal, lead to lower production.   For a
fuller account see Enoch (1978).

71 Production of the food, drink and tobacco, coal and petroleum
product industries is excluded from the above scheme and is added
exogenously to yield total manufacturing output.   The output of the
general government sector is assumed to be a constant proportion of
public spending, while North Sea oil production is determined
exogenously.   All other output forms the algebraic residual in
summing to the output measure of GDP (see paragraph 67).

72 'Effective' output is calculated for the manufacturing and
'other' sectors in order to assist in the specification of overtime
(paragraph 79).   'Effective' output is that output which would
in the steady state be associated with the current level of employment.
(For manufacturing, the equation for effective output is not consistent
with the employment equation at present in the model.)

Composition of output

Derivation of output of finished manufactures

Proxy for demand

$$\frac{MND}{EFC} = + \underset{(32.3)}{1.56532} \left[\frac{0.13\ CND + 0.5\ CD + 0.139G}{EFC} \right] + 2.0\ \Big[(0.4\ INP$$

$$+ 0.2\ IHP + 0.32\ ING + 0.2\ IHG + 0.3\ IIB + 0.4\ IIW + 0.4\ IIR$$

$$+ 0.25\ IIO - 0.25\ ADJ)/EFC \Big] + \underset{(14.5)}{0.68321}\ \frac{XGMA}{EFC}$$

$$\text{where } EFC = \frac{\sum\limits_{i=o}^{7} 0.95^i\ EF_{-i}}{\sum\limits_{i=o}^{7} 0.95^i}$$

$\bar{R}^2 = 0.385$ SE = 0.006   DW = 1.1   1964 I − 1978 II

Allocation to domestic output

$$\frac{1.67\ MPRM-IIFM-0.68321\ XGMA}{MND-0.68321\ XGMA} = 1.16915 - \underset{(11.9)}{0.00520}\ TIME$$
$$\phantom{\frac{1.67\ MPRM}{MND}} \quad \underset{(8.4)}{}$$

$$+ \underset{(4.2)}{0.37586} \left[\frac{\tfrac{1}{8} \sum\limits_{i=o}^{7} (MND-0.68321\ XGMA)_{-i}}{MND-0.68321\ XGMA} \right]$$

$$- 0.31076 \left[\tfrac{1}{2} \left[\tfrac{1}{2} \sum_{i=0}^{1} \left(\frac{PIMO}{UMM}\right)_{-i} + \sum_{i=0}^{2} A_i \left(\frac{NULC}{100}\right)_{-i} \right] \right]$$
$$(3.7)$$
$$+ 0.40801 \, u_{-1}$$
$$(3.0)$$

$A_{0-2} = 0.25; \ 0.50; \ 0.25$

$\bar{R}^2 = 0.93 \qquad SE = 0.0156 \qquad 1965 \ I - 1978 \ I$

Manufacturing production

$MPRO = MPRM + MPRX$

$PROM = MPRO/64.1$

Output of 'other' sector

$OOTH = GDPO - (MPRO + 0.6G + 40.5 \ NSO)$

Measures of 'effective' output

Manufacturing

$MPRL = \exp(0.89919 \ln MPRL_{-1} + (1-0.89919) \ln MPRO)$

'Other'

$OOTL = \exp(0.59864 \ln OOTL_{-1} + (1-0.59864) \ln OOTH)$

Employment and unemployment

73 The equation for employment in the non-trading public sector contains
a long-run structure embedded in a short-run adjustment process. The
long-run characteristic is that productivity follows a falling trend:
because output in this sector is computed, in national accounting, on
the basis of labour input, this could be interpreted as a tendency for
the composition of such employment to include an increasingly higher
proportion of lower paid, perhaps part-time, workers. It is a matter
for judgment whether to retain this property when using the model for,
say, forecasting. Around this long-term trend there are short-term
adjustments of employment to changes in output, itself assumed, again as
in national accounting, to be related to public consumption. A dummy
reflects the reorganisation of local government in 1974.

33

74 Employment in manufacturing is modelled by a similar approach,
but a reasonable fit to the past is only achieved by introducing a
split time trend which implies that underlying productivity rose at
3 1/2% per annum before 1974 but at only 1% per annum since. Again, a
judgment has to be made about the persistence of such trends when
using the model.   Short-term shifts in employment about the long-term
trend are caused by lagged adjustment to changes in output, by
changes in investment and in unit labour costs, and by special
employment measures.   As regards the last of these, the model suggests
that some 30% of total places under special schemes represent a net
addition to employment in the short run, but that in the long term
such schemes will have no net effect on employment.

75 Other employment is related to relevant output, with dummies
reflecting rates of selective employment tax (when operative) and
the shake-out of nationalised industries' employment in the 1960s;
and a declining time trend represents productivity growth.

76 The equation for registered unemployment is imposed because
of the breakdown in recent years of equations that tracked earlier
periods reasonably well.   The equation states that one half of
any change in the population of working age not in full-time education
will be reflected in a change in unemployment if employment remains
constant, and that 15%, 65% or 80% of any increase in jobs - which
figure depends on the category - will be reflected in a reduction
in unemployment if the population of working age is unchanged.

Employment and unemployment

Employment

Non-trading public sector

$$LEG = LEG_{-1} + \underset{(0.8)}{0.03178}\ \Delta G + \underset{(2.7)}{0.10381}\ \Delta G_{-1} + \underset{(3.4)}{0.1351}\ \Delta G_{-2} + \underset{(1.2)}{0.04383}\ \Delta G_{-3}$$

$$- \underset{(0.6)}{100.39}\ \ln\ (G_{-1}/LEG_{-1}) + \underset{(1.2)}{57.764}\ -\ \underset{(1.4)}{0.38157}\ TIME$$

$$+ \underset{(11.8)}{206.59}\ \Delta D74B + \underset{(5.2)}{91.045}\ \Delta D74B_{-1}$$

$$\bar{R}^2 = 0.75 \qquad SE = 16.8 \qquad DW = 1.8 \qquad 1964\ III - 1978\ II$$

Manufacturing industry

$$\Delta \text{LEMF} = \underset{(4.5)}{0.12926} \ \Delta\text{MPRO} - \underset{(2.5)}{0.1475} \ \Delta\text{MPRO}_{-1} - \underset{(2.6)}{0.12219} \ \Delta\text{MPRO}_{-2}$$

$$\quad - \underset{(2.6)}{0.10519} \ \Delta\text{MPRO}_{-3} - \underset{(1.3)}{0.03878} \ \Delta\text{MPRO}_{-4} + \underset{(1.2)}{0.08346} \ (\text{IPMM} - \text{IPMM}_{-4})$$

$$\quad + \underset{(0.9)}{0.2852} \ \Delta\text{TES} - \underset{(3.7)}{602.68} \quad (\text{ULC} - \text{ULC}_{-4})$$

$$\quad + \underset{(5.6)}{2319.2} \ \ln \ (\text{MPRO}_{-1}/\text{LEMF}_{-1}) + \underset{(5.4)}{1925.8} \quad^{-} \quad \underset{(5.4)}{20.590} \quad \text{TIME}$$

$$\quad + \underset{(5.6)}{15.542} \quad \text{D73T}_{-2}$$

$$\bar{R}^2 = 0.832 \qquad \text{SE} = 21.046 \qquad \text{DW} = 1.8 \qquad 1966 \text{ I} - 1978 \text{ II}$$

'Other' (excluding North Sea oil and HM forces) and self-employed

$$\ln \ (\text{LOTH} + \text{LSE}) = \underset{(3.7)}{2.2154} \ + \ \underset{(7.2)}{0.59864} \ \ln \ (\text{LOTH} + \text{LSE})_{-1}$$

$$\quad + \underset{(4.0)}{0.17067} \ \ln \ \text{OOTH} - \underset{(4.4)}{0.0022} \ \text{DNAT} - \underset{(2.5)}{0.00191} \ \text{DSET}$$

$$\quad - \underset{(1.7)}{0.00023} \ \text{D73T}$$

$$\bar{R}^2 = 0.962 \qquad \text{SE} = 0.004 \qquad 1964 \text{ II}-1978 \text{ II}$$

Total employees in employment

$$\text{LE} = \text{LEG} - \text{LHMF} + \text{LOIL} + \text{LEMF} + \text{LOTH}$$

Productivity

$$\text{PDTY} = \frac{\text{GDP}}{\text{LE}}$$

Population of working age, excluding those in full-time education

$$\text{POWA} = \text{POP} - \text{FTE}$$

Unemployment

Numbers registered, excluding school-leavers and adult students

$$\text{LU} = \text{LU}_{-1} + 0.5 \ \Delta\text{POWA} - 0.8 \ \Delta \ (\text{LOIL} + \text{LEMF})$$

$$\quad - 0.65 \ \Delta \ (\text{LOTH} + \text{LSE} + \text{LEG}) - 0.15 \ \Delta\text{LHMF}$$

Rate of unemployment

$$\text{UR} = \frac{\text{LU}}{\text{LE} + \text{LU}} \ .100$$

Wage rates, hours and costs

77 The central relationship in the determination of earnings is that for the settlement rate. Empirical research has, however, failed to yield a satisfactory estimated equation; consequently, the formula described here is an imposed one.

78 The settlement rate is assumed to consist of an exogenous element - a real wage increment - which is added to the past rate of increase in consumer prices to form the initial settlement rate (GSRO). The actual settlement rate is additionally influenced by the presumption that to a certain (exogenous) extent settlements may be higher/lower if the sum of personal income tax and employee national insurance contributions rises/falls as a proportion of gross earnings, this adjustment operating over a period of three years.

79 Normal (basic, excluding overtime) working hours are exogenous, but actual hours worked depend on the deviations of output from 'effective' output (see paragraph 72) - in other words, on the extent to which employment has not adjusted to what present levels of production would, in the steady state, imply.

80 Normal weekly earnings (wages and salaries) are those associated with unchanged normal hours, so that changes depend only upon the settlement rate and the proportion of the workforce settling. Usual earnings include the effect of 'usual' (cyclically adjusted) overtime, and are specified as changing when normal hours change. Actual earnings encompass all earnings, including those from actual overtime: hence the equation includes actual hours worked.

81 The $\tan^{-1}$ structures in the equations for usual and actual earnings represent the assumption that overtime premia are a function of the extent of overtime working.

82 Although there is no pressure-of-demand variable in the equations for the settlement rate, the operation of the overtime system endows the model with certain short-term positive responses of pay to changes in activity, for a given fiscal stance. Long-term effects depend on the nature of any change in demand and the accompanying behaviour of productivity and the exchange rate.

83 Movements in earnings of HM Forces are assumed to follow those for employees in other sectors. Earnings of the self-employed are estimated to move in relation to earnings of employees and to companies' trading profits.

84 Average earnings per employee in manufacturing is specified to move with usual weekly earnings. It is then modified to provide an expression for employment costs per employee in manufacturing, which is converted by a further, simple equation from 'per employee' to 'per unit of output'. Employment costs per employee in the whole economy is modelled as the ratio of relevant costs to employment. Finally, there is an expression for employment costs per unit of output in the whole economy except for North Sea oil: the equation rests on the assumption that labour costs in the North Sea sector are sufficiently low in relation to the value of output to be disregarded.

Wage rates, hours and costs

Gross settlement rate

Before taking account of effect of changes in personal direct taxes and national insurance contributions

$$GSRO = DRWI + 100 \; (PC_{-1} - PC_{-5})/PC_{-5}$$

Actual

$$GSR = GSRO + RRWT \; \frac{1}{3} \sum_{i=0}^{2} \left[\frac{(t+n) - (t+n)_{-4}}{1-(t+n)} \cdot (1 + \frac{GSRO}{100}) \right.$$
$$\left. - \frac{(ta-f) - (ta-f)_{-4} \cdot (1 + GSRO/100)}{WSN_{-4}(1 - (t+n))} \right]_{-4i}$$

where $t = TRY/100$

$n = GRJ/100$

$$a = \frac{MSCR + (TARR/(TRY/100))}{4(1.45 \; NTAM + NTAS)}$$

$f = 13(RFJ + GIJ)$

Hours worked

In manufacturing industry

$$HMF = 9.70 \; HN^{0.4} \; (MPRO/MPRL)^1$$

In other industries

$$HOT = 9.70 \; HN^{0.4} \; (OOTH/OOTL)^{0.17067/(1-0.59864)}$$

Average wages and salaries

Normal weekly

$$WSN = WSN_{-1}\left[(1 + \frac{GSR}{100})^{(DPES/2)} \cdot (1 + \frac{GSR}{100})^{(DPES/2)}_{-1} - 1\right]$$

Usual weekly

$$WSU = WSN\left[1 + \frac{LEMF}{LE}(\frac{9.7}{HN^{0.6}} - 1)(0.75 + \frac{1.5}{\pi}\tan^{-1}(\frac{9.7/HN^{0.6} - 0.95}{0.1}))\right.$$

$$\left. + \frac{LOTH}{LE}(\frac{9.7}{HN^{0.6}} - 1)(0.5 + \frac{1}{\pi}\tan^{-1}(\frac{9.7/HN^{0.6} - 0.95}{0.1}))\right]$$

Actual weekly

$$WS = WSN\left[1 + \frac{LEMF}{LE}(\frac{HMF}{HN} - 1)(0.75 + \frac{1.5}{\pi}\tan^{-1}(\frac{HMF/HN - 0.95}{0.1}))\right.$$

$$\left. + \frac{LOTH}{LE}(\frac{HOT}{HN} - 1)(0.5 + \frac{1}{\pi}\tan^{-1}(\frac{HOT/HN - 0.95}{0.1}))\right]$$

HM Forces

$$WFP = WFP_{-4}(WSU/WSU_{-4})$$

Self-employed

$$\ln WSE = \ln WSE_{-1} + \underset{(8.2)}{0.82215}\,\Delta\ln WS + \underset{(0.6)}{0.2624}\,\Delta\ln\left[1 + \frac{YCTP}{GDP\pounds}\right]$$

$$\bar{R}^2 = -0.048 \quad SE = 0.025 \quad DW = 1.7 \quad 1960\ II-1978\ II$$

Costs

Average earnings per employee in manufacturing

$$\Delta\ln WAEM = \Delta\ln WSU$$

Employment costs per employee in manufacturing

$$ECMM = \frac{(YWS + YEC + YECS + TSET).WAEM}{YWS}$$

Employment costs per employee, whole economy

$$ECM = (YWS + YEC + YECS)/LE$$

Employment costs per unit of output in manufacturing

$$\Delta\ln MULC = \Delta\ln ECMM - 0.00693$$

Employment costs per unit of output, excluding North Sea oil

$$ULC = \frac{YWS + YEC + YECS + TSET}{GDP - 40.5\ NSO}$$

Exchange rate and reserves

85 Some of the research from which this section of the model'
has evolved is to be described in a forthcoming paper by Saville.
Although the coefficients in the equations are imposed, they are
based where at all possible on empirical findings.   The main
relationships determine the sterling/dollar exchange rate.   Future

work may be directed to modelling the effective sterling rate more directly than at present.

86 It is assumed that the long-term equilibrium path of the sterling/ dollar exchange rate is determined by the growth of money stock relative to income in the United Kingdom compared with the United States.   (This structure was adopted before Saville's evidence, leaning in favour of purchasing power parity, became available.) Deviations from equilibrium result in the creation of pressure on the rate.   In the long-run, pressure will set the exchange rate on its equilibrium path, after allowance for such official intervention as will set the reserves on their equilibrium path (defined to grow in line with the value of imports), too.

87 In addition to this long-term equilibrating process, pressure is created by a variety of shorter-run factors.   Taken together, the overall determination of pressure is by the deviation of the actual exchange rate from its equilibrium, relative growth of US money to UK ex-ante money (DCE plus expected change in reserves), the covered interest-rate differential, the deviation of the UK current balance from its recent average, relative price inflation between the United States and United Kingdom, and the expected change in the exchange rate.   This last term is in turn modelled on the assumption that the market uses the same model in forming its expectations about the exchange rate.   Pressure is measured as a weighted average of the change in the exchange rate and the change in reserves, expressed as a percentage move in the former but equally representable in terms of the latter.

88 A reaction function determines the changes in reserves.   It is, in effect, a non-linear function of pressure (represented here, for ease of exposition, by its reserve-change equivalent, R$O) and of the divergence of reserves from equilibrium.   The mechanism is such that small amounts of pressure, up or down, are reflected almost wholly in day-to-day movements in the exchange rate, which are not resisted; larger amounts of pressure lead to some intervention - synonymous here, by assumption, with the change in reserves - in the interests of smoothing the path of the rate; but extremely strong pressure has to be taken almost entirely on the rate, because, it is assumed, reserves cannot be stretched beyond certain bounds of famine or plenty.   At the same time, intervention is influenced by the divergence of reserves from equilibrium, so that, for example, a given amount of downward

pressure will result in more intervention the higher the level of reserves. Non-linearities in reactions are captured by the $\tan^{-1}$ format of relevant equations.

89 The movement in the exchange rate follows as that part of pressure which is not met by intervention.

90 Reaction of interest rates to pressure is not excluded, since pressure and reserve changes appear in the short-term interest-rate equation (see paragraph 108).

91 Once the sterling/dollar exchange rate has been determined, the effective rate is derived by identity, using an effective rate for the dollar (WER) that is calculated with UK effective rate weights and is exogenous.

92 Finally, the forward discount of sterling against the dollar relates to the uncovered interest-rate differential and the expected change in the exchange rate.

Exchange rate and reserves

Note: The intermediate variables PERE, R$O and R$OE are not included explicitly in the model, but are replaced in relevant equations by their determining identities.

Equilibrium $/£ exchange rate

$$EE\$ = 45 \frac{M2US}{KM\pounds S} \frac{\sum\limits_{i=0}^{7} 0.8^i \ EF\pounds_{-i} / \sum\limits_{i=0}^{7} 0.8^i}{\sum\limits_{i=0}^{7} 0.8^i \ EFUS_{-i} / \sum\limits_{i=0}^{7} 0.8^i}$$

Equilibrium reserves

$$KR\$M = 0.6 \ \sum\limits_{i=0}^{7} 0.8^i \left[\frac{2.222}{ERUK} \ M\pounds \right]_{-i} / \sum\limits_{i=0}^{7} 0.8^i$$

Pressure on $/£ exchange rate

$$PERK = 0.1 \left[\frac{EE\$ - E\$EQ}{E\$EQ} \right]_{-1} 100$$

$$+ \ 0.4 \left[\frac{\Delta M2US}{M2US_{-1}} - \frac{DC\pounds S + R\$E_{-1}/E\$EQ_{-1}}{KM\pounds S_{-1}} \right] 100$$

$$+ \ 1.5 \ \Delta(RLAE - RFDE - REUE)$$

$$+ \; 0.1 \left[\frac{BAL - \sum\limits_{i=0}^{7} 0.8^i \; BAL_{-i} / \sum\limits_{i=0}^{7} 0.8^i}{\sum\limits_{i=0}^{7} 0.8^i \; GDP£_{-i} / \sum\limits_{i=0}^{7} 0.8^i} \right] 100$$

$$+ \; 0.4 \left[\frac{\Delta PCUS}{PCUS_{-1}} - \frac{\Delta PC}{PC_{-1}} \right] 100 + 1.0 \; DE\$E_{-1}$$

Expected pressure on $/£ exchange rate

$$PERE = 0.1 \left[\frac{EE\$ - E\$EQ}{E\$EQ} \right] 100 + 0.5 \left[PERK - 0.1 \frac{EE\$_{-1} - E\$EQ_{-1}}{E\$EQ_{-1}} 100 \right]$$

Expected change in reserves necessary to hold exchange rate constant

$$R\$OE = PERE \; . \; PCOM \; . \; TWIP \; . \; 850/10000$$

Change in reserves necessary to hold exchange rate constant

$$R\$O \; = PERK \; . \; PCOM \; . \; TWIP \; . \; 850/10000$$

Expected change in reserves

$$R\$E \;\; = \left[0.5 \tan^{-1} \left\{ \frac{\pi}{2} \; . \; \frac{KR\$_{-1} + R\$OE - KR\$M}{KR\$M} \right\} \right.$$

$$\left. + \; 0.5 \tan^{-1} \left\{ \frac{\pi}{2} \; \frac{KR\$_{-1} - KR\$M}{KR\$M} \right\} - \frac{\pi}{2} \; . \; \frac{KR\$_{-1} - KR\$M}{KR\$M} \right] \frac{2}{\pi} \; KR\$M$$

Expected change in $/£ exchange rate

$$DE\$E = PERE - \frac{R\$E \; . \; 10000}{PCOM \; . \; TWIP \; . \; 850}$$

Actual change in reserves

$$R\$ \;\; = \left[0.5 \tan^{-1} \left\{ \frac{\pi}{2} \; . \; \frac{KR\$_{-1} + R\$O - KR\$M}{KR\$M} \right\} \right.$$

$$\left. + \; 0.5 \tan^{-1} \left\{ \frac{\pi}{2} \; \frac{KR\$_{-1} - KR\$M}{KR\$M} \right\} - \frac{\pi}{2} \; \frac{KR\$_{-1} - KR\$M}{KR\$M} \right] \frac{2}{\pi} \; KR\$M$$

Stock of reserves

$$KR\$ = KR\$_{-1} + R\$$$

Sterling exchange rate

$/£, end-quarter

$$E\$EQ = E\$EQ_{-1} \left[1 + (PERK - \frac{R\$. 10000}{850 \; . \; PCOM \; . \; TWIP})/100 \right]$$

$/£, index of quarterly average

$$ERUK = 2.222/(0.5(E\$EQ + E\$EQ_{-1}) + E\$QA)$$

Effective rate index

$$EER \;\; = WER/ERUK$$

Forward discount on $/£ rate

End-quarter

RFDE = 0.5 + 0.84 (RLAE - REUE) - 0.16 DE$E

Quarterly average

RFDS = (RFDE + RFDE$_{-1}$)/2

World prices and UK import prices

93 All commodity prices and prices of manufactured goods in other countries are exogenous.

94 Various global price indices are converted into sterling by the relevant exchange rate (in one instance the 'green' pound, which is exogenous) and weighted together to provide a 'simplified' unit value index for imports of food, drink and tobacco. Two straightforward equations convert this first to the actual unit value index and then to the price deflator (average value index).

95 The unit value index for imports of industrial materials is related (non-linearly) to world prices of manufactures, the cyclical position of OECD industrial production and a real interest rate. Again, a simple equation converts this to the average value index.

96 The unit value index for imports of finished manufactures is determined by the prices of both world manufactures and UK manufactures, the latter term implying that overseas suppliers are affected in setting prices for the UK market by prices of competing UK goods. A negative coefficient on a term in UMIM follows from various approximations and allows for the fact that the series for world prices of manufactures covers some semi-manufactures which are not included in the definition of the dependent variable. The change in the exchange rate is included in the equation to take account of short-run delays in changing invoiced prices when the exchange rate shifts. Another simple equation leads to the average value index.

97 The price deflator for imports of services is modelled as a lagged function of prices of world manufactures.

98 The series under 'miscellaneous' treat North Sea oil consumed domestically as if it were imported. UMC, PMA and PMAM embody a further adjustment for the workings of the Common Agricultural Policy.

42

<div align="center">World prices and UK import prices</div>

Competing exports

$$PCOM = PCOM_{-1}(PXWM/PXWM_{-1})$$

Imports of food, drink and tobacco

Simplified £ unit value index

$$UVIS = 0.3775\ (UVF1.ERUK) + 0.2881\ (UVF2.ERUK) + 0.3344\ (\frac{UVF3}{ERG})$$

Unit value index

$$\ln UVIF = 0.9825\ \ln UVIS$$
$$(22.1)$$

$$\bar{R}^2 = 0.964 \qquad SE = 0.019 \qquad DW = 1.2 \qquad 1975\ I-1977\ II$$

Average value index

$$\ln PFDT = 0.94484\ \ln UVIF + 0.48502\ u_{-1}$$
$$(128.4) \qquad\qquad (3.5)$$

$$\bar{R}^2 = 0.999 \qquad SE = 0.015 \qquad 1967\ II-1978\ II$$

Imports of fuel

Average value index

$$PFL = PFL\$.ERUK$$

Imputed AVI as if there was no North Sea oil

$$PFLO = PFO\$.ERUK$$

Imports of industrial materials

$ unit value index

$$\frac{UMI\$}{PXWM} = 0.86253 + 0.00335 DWIP + 0.17404\ (1 + \frac{DWIP}{100}) \cdot (\frac{PFLO}{ERUK.PXWM})$$
$$(45.7) \qquad (3.1) \qquad\qquad (6.7)$$
$$- 0.00255\ \left[REUE - 100\ \frac{UMI\$ - UMI\$_{-4}}{UMI\$_{-4}} \right]_{-1}$$

$$\bar{R}^2 = 0.887 \qquad SE = 0.023 \qquad DW = 1.8 \qquad 1972\ I-1977\ II$$

£ unit value index

$$UMIM = ERUK.UMI\$$$

Average value index

$$\ln PMIM = -0.03727 + 0.94426\ \ln UMIM + 0.66772\ u_{-1}$$
$$(0.3) \qquad (29.8) \qquad\qquad (4.1)$$

$$\bar{R}^2 = 0.996 \qquad SE = 0.236 \qquad 1970\ II-1978\ II$$

Imports of finished manufactures

$ unit value index

$$\ln UMM\$ = 0.7639\ \ln PXWM + 0.3753 + 0.2474\ \ln (\frac{PIMN}{ERUK})$$
$$(7.2) \qquad\qquad (3.5) \qquad (2.1)$$
$$- 0.3571\ (\frac{UMIM}{UMM}) - 0.0708\ \Delta\ln ERUK + 0.7234\ u_{-1}$$
$$(3.3) \qquad\qquad (1.0) \qquad\qquad (8.1)$$

$$\bar{R}^2 = 0.999 \qquad SE = 0.0112 \qquad 1963\ III-1978\ II$$

£ unit value index

UMM = ERUK.UMM$

Average value index

$$\ln \text{PMM} = \underset{(1.5)}{-0.0058} + \underset{(74.5)}{0.9438} \ln \text{UMM} + \underset{(3.4)}{0.4155} \ln \left(\frac{\text{PMM}_{-1}}{\text{UMM}_{-1}}\right)$$

$$\bar{R}^2 = 0.998 \quad SE = 0.0197 \quad DW = 2.0 \quad 1963\ II\text{-}1978\ II$$

Total imports of goods, AVI

$$\ln \text{PMG} = \underset{(4.3)}{-0.00666} + \underset{(340.2)}{1.03506} \ln \Big/ (\text{PFDT.MGFD} + \text{PFL.MG2}$$

$$+ \text{PMIM (MGIM + MGPS)} + \text{PMM (MGFM + MGA1 + MGNS)})/$$

$$(\text{MGFD + MG2 + MGIM + MGPS + MGFM + MGA1 + MGNS}) \Big/$$

$$\bar{R}^2 = 0.999 \qquad SE = 0.008 \qquad DW = 1.4 \qquad 1970\ I\text{-}1978\ II$$

Imports of services, AVI

$$*\ln \text{PMS} = \ln \text{PMS}_{-1} + \sum_{i=0}^{3} A_i \ \Delta\ln (\text{PXWM.ERUK})_{-i}$$

$$A_{0-3} = \underset{(3.1)}{0.4833}; \quad \underset{(6.3)}{0.2681}; \quad \underset{(1.3)}{0.1159}; \quad \underset{(0.3)}{0.0265}. \quad \Sigma A_i = \underset{(6.3)}{0.8938}$$

$$\bar{R}^2 = 0.456 \qquad SE = 0.028 \qquad DW = 2.0 \qquad 1964\ I\text{-}1976\ I$$

Imports of goods and services, AVI

PM = M£/M

Miscellaneous (see paragraph 98)

Import costs per unit of GDP

$$\text{UMC} = \frac{(\text{M£} + 0.2881 \ \text{UVF2}\left[\frac{1.166}{\text{ERG}} - \text{ERUK}\right]) \text{MGFD} + (40.5 \ \text{NSO} - \text{XG2B}\frac{40.5}{37.3}) \text{PX2B}}{\text{GDP} - 40.5 \ \text{NSO}}$$

Import AVI for goods.

$$\text{PMGA} = \frac{\text{MG£} + (40.5 \ \text{NSO} - \text{XG2B} \ \frac{40.5}{37.3}) \ \text{PX2B}}{\text{MG} + (40.5 \ \text{NSO} - \text{XG2B} \ \frac{40.5}{37.3})}$$

Import AVI for goods and services.

$$\text{PMA} = \frac{(\text{M£} + 0.2881 \ \text{UVF2}\left[\frac{1.166}{\text{ERG}} - \text{ERUK}\right]) \text{MGFD} + (40.5 \ \text{NSO} - \text{XG2B}\frac{40.5}{37.3}) \text{PX2B}}{\text{M} + 40.5 \ \text{NSO} - \text{XG2B}\frac{40.5}{37.3}}$$

Import AVI for goods and services, excluding finished manufactures

$$\text{PMAM} = \frac{\text{PMA}(\text{M} + 40.5 \ \text{NSO} - \frac{40.5}{37.3} \ \text{XG2B}) - \text{PMM.MGFM}}{(\text{M} + 40.5.\text{NSO} - \frac{40.5}{37.3} \ \text{XG2B} - \text{MGFM})}$$

Domestic prices

99 A large number of domestic prices are identified in the model;
they will not all receive individual mention. In general, prices
are determined by costs, usually after a lag. The equations are not
necessarily homogeneous in costs - either because the cost variables
are not sufficiently comprehensive or precise, or because profit
margins have followed some trend during the estimation period.
Functional forms vary according to the varying success with different
approaches in empirical research. Substantial problems have been
encountered in the attempt to build a consistent prices sector on the
basis of the 1975 price-based national accounts data, and the equations
at present in the model are very much stop-gaps, pending further research.

100 Wholesale prices are central to the system. They are determined
by employment costs per man in manufacturing, relevant indirect
taxes, productivity and import costs; research has not suggested
that they are influenced by the prices of competing foreign
goods. There is a negative time trend, which is steeper from 1973
onwards; this parallels the squeeze of profit margins that has been
in evidence, but provides no explanation for it. There is a dummy
variable which allows for a small adjustment to the burden of indirect
taxation on the introduction of value added tax. Equations for most
other price deflators follow along similar lines, having relevant costs
as explanatory variables, but, as mentioned above, varying functional
forms. Deflators for various aggregates follow arithmetically.

101 The exception to this general approach is the deflator for private
residential investment, where financial factors directly play an
important part. The price deflator is specified as a distributed lag
of the price of new houses mortgaged by building societies, which
is in turn related positively to the real level of loans for house
purchase, negatively to housing investment and positively to
persons' surplus liquidity; a dummy takes account of the
construction workers' strike in 1972.

102 Two proxies for price expectations are calculated. One is based
mainly on past movements in prices, but includes expectations of any
change in the exchange rate. The other is based on past growth of
the money stock together with expected growth as portrayed by the
current pace of DCE and the expected change in foreign exchange reserves.
Elsewhere in the model, price expectations affect interest rates and
various financial flows.

Domestic prices

Wholesale price of manufacturing output

$$\Delta\ln PIMO = -0.60229 + 0.00335\ Q1 - 0.00147\ TIME$$
$$\qquad\quad (2.8)\qquad (2.1)\qquad\qquad (1.9)$$

$$\qquad - 0.00018\ TIME.D73A_{-2} - 0.02065\ D73C$$
$$\qquad\quad (1.5)\qquad\qquad\qquad (3.4)$$

$$+ 0.37652\ \Delta\ln\left[1 + \frac{FCA\pounds - ACAR_{-1} - AVAT_{-1} - ANSR - YECS - TSET}{GDP\pounds}\right]$$
$$\quad (3.2)$$

$$+ 0.13968\ \ln\left(\frac{ECMM_{-1}}{PIMO_{-1}}\right) + 0.1104\ \ln\left(\frac{PMAM_{-1}}{PIMO_{-1}}\right)$$
$$\quad (2.8)\qquad\qquad\qquad (3.2)$$

$$+ 0.06703\ \Delta\ln PMAM_{-1} + 0.05289\ \Delta\ln PMAM + 0.09464\ \Delta\ln ECMM$$
$$\quad (1.6)\qquad\qquad\qquad (1.5)\qquad\qquad\qquad (1.2)$$

$$+ 0.02822\ \ln PIMO_{-1} - 0.02289\ \Delta\ln\left(\frac{MPRO}{LEMF}\right) + 0.37608\ u_{-1}$$
$$\quad (1.3)\qquad\qquad\quad (.5)\qquad\qquad\qquad (2.4)$$

$$\bar{R}^2 = 0.889 \qquad SE = 0.006 \qquad 1963\ IV-1978\ II$$

Excluding indirect taxes

$$PIMN = \frac{PIMO/\left[D73C + (1-D73C)\exp(0.02758)\right]}{\exp.\ 0.18462\ \ln\left[1 + (FCA\pounds - AVAT_{-1} - ACAR_{-1} - ANSR - YECS)/GDP\pounds\right]}$$

Wholesale price of coal

$$PCL = PCL_{-4}.WS/WS_{-4}$$

Imputed retail price of motor spirit

$$PFLI = \frac{(35.1PFLO + RHCO)\ (1 + RVHC/100)}{72.0}$$

Consumer price deflators

Non-durables, total

$$*\ \ln PCND = \ln PCND_{-1} + 0.65141\ \Delta\ln PIMN + 0.2087\ \Delta\ln ULC$$
$$\qquad\qquad\qquad\qquad\qquad (6.4)\qquad\qquad\qquad (2.6)$$

$$+ 0.0266\ \Delta\ln UMC + 1.3699\ \Delta\ln (1 + NETX)$$
$$\quad (0.8)\qquad\qquad\quad (4.7)$$

$$+ 0.48977\ \Delta\ln (1 + NETX)_{-1}$$
$$\quad (1.7)$$

$$\bar{R}^2 = 0.70 \qquad SE = 0.85 \qquad DW = 1.7 \qquad 1966\ I-1976\ I$$

Beer

$$\frac{\Delta P3}{1 + \frac{VATS}{100}} = 0.69313\ \Delta PIMN + 0.01449\ \Delta CEDB$$
$$\qquad\qquad (9.8)\qquad\qquad\quad (7.1)$$

$$\bar{R}^2 = 0.705 \qquad SE = 0.013 \qquad DW = 2.0 \qquad 1965\ II-1978\ II$$

Wines and spirits

$$\frac{\Delta PWS}{1+\frac{VATS}{100}} = \underset{(2.9)}{0.28461}\ \Delta PIMN + \underset{(5.1)}{0.18019}\ \Delta\left[\frac{CEDW(330)}{1.613(941)} + \frac{CEDS(611)}{18.85(941)}\right]$$

$$+ \underset{(2.7)}{0.09468}\ \Delta\left[\frac{CEDW(330)}{1.613(941)} + \frac{CEDS(611)}{18.85(941)}\right]_{-1}$$

$\bar{R}^2 = 0.512$ SE = 0.017   DW = 2.1   1965 II-1978 II

Tobacco

$$*PT\ (1 - \frac{VATS}{100+VATS} - \frac{RDT}{100}) = \underset{(20.9)}{0.23574}\ PIMN + \underset{(13.8)}{0.061}\ CEDT$$

$$+ \underset{(5.0)}{0.03144}\ CEDT_{-1} + \underset{(2.0)}{0.00944}\ CEDT_{-2}$$

$$+ \underset{(8.9)}{0.07619}\ DTNO$$

$\bar{R}^2 = 0.992$ SE = 0.0148   DW = 1.8   1965 II-1978 I

Vehicles and industrial building

$$\ln PVIB = \ln PVIB_{-1} + \underset{(5.8)}{0.71344}\ \Delta\ln PIMO + \underset{(3.1)}{0.29239}\ \Delta\ln ULC$$

$$- \underset{(0.4)}{0.01464}\ \Delta\ln UMC + \underset{(3.5)}{0.45596}\ u_{-1}$$

$\bar{R}^2 = 0.64$ SE = 0.013   1963 III-1978 II

Shipping

$$*\ln PINS = \ln PINS_{-1} + \underset{(1.1)}{0.72785}\ \Delta\ln PIMN + \underset{(0.6)}{0.40169}\ \Delta\ln PIMN_{-1}$$

$$- \underset{(0.1)}{0.04763}\ \Delta\ln ULC + \underset{(0.3)}{0.41846}\ \Delta\ln (1+NETX)$$

$$+ \underset{(0.4)}{0.50342}\ \Delta\ln (1+NETX)_{-1}$$

$\bar{R}^2 = 0.14$ SE = 3.9   DW = 2.9   1966 I-1976 I

Private residential

$$\Delta\ln PIHP = \sum_{i=0}^{8} A_i\ \Delta\ln PNH_{-i}$$

$$A_{0-8} = \underset{(1.5)}{0.0509};\ \underset{(4.9)}{0.0946};\ \underset{(13.5)}{0.1258};\ \underset{(19.3)}{0.1448};\ \underset{(13.1)}{0.1514};\ \underset{(10.1)}{0.1458}$$

$$\underset{(8.6)}{0.1278};\ \underset{(7.7)}{0.0976};\ \underset{(7.1)}{0.0549}\quad \underset{(20.2)}{\sum_i A_i = 0.9935}$$

$\bar{R}^2 = 0.644$ SE = 0.011   DW = 1.6   1970 II-1978 I

where the unit value of houses mortgaged by building societies is given by

$$100 \frac{\Delta PNH}{PNH_{-1}} = \sum_{i=0}^{4} A_i \left[\frac{LZNA + LHBB + LHPG + LHPV}{PNH_{-1}} \right]_{-i} + \sum_{i=1}^{8} B_i \, IHP_{-i}$$

$$+ \underset{(3.4)}{3.0802} \; \Delta D723 + \underset{(2.0)}{0.00015} \left(\frac{NLAJ-NLJL}{PNH} \right)_{-1} + \underset{(2.9)}{0.37802} \; u_{-1}$$

$$A_{0-4} = \underset{(2.3)}{0.00292}; \quad \underset{(5.6)}{0.00279}; \quad \underset{(3.5)}{0.00243}; \quad \underset{(2.2)}{0.00185}; \quad \underset{(1.6)}{0.00104}.$$

$$\Sigma A_i = 0.01102$$

$$B_1 = B_8 = \underset{(3.1)}{-0.00064} \quad B_2 = B_7 = \underset{(3.1)}{-0.00112} \quad B_3 = B_6 = \underset{(3.1)}{-0.00144}$$

$$B_4 = B_5 = \underset{(3.1)}{-0.00160} \quad \Sigma B_i = \underset{(3.1)}{-0.00958} \quad \cdot$$

$$\bar{R}^2 = 0.636 \qquad SE = 1.5 \qquad 1964 \; II-1978 \; II$$

Residual investment

PIRS = PINP

Durables

$$\ln PCD = \ln PCD_{-1} + \underset{(1.2)}{0.33974} \; \Delta \ln PIMO + \underset{(1.8)}{0.44933} \; \Delta \ln PIMO_{-1}$$

$$+ \underset{(0.4)}{0.25160} \; \Delta \ln (1+NETX) + \underset{(0.8)}{0.50525} \; \Delta \ln (1+NETX)_{-1}$$

$$+ \underset{(3.8)}{0.34377} \; \Delta \ln \left[1 + \frac{TRCD}{100} - NETX \right] . D73B$$

$$+ \underset{(1.1)}{0.29030} \; \Delta \ln \left[1 + \frac{TRCD}{100} - NETX \right] . (1-D73B) + \underset{(2.0)}{0.10835} \Delta \ln UMC$$

$$- \underset{(3.2)}{0.42622} \; u_{-1}$$

$$R^2 = 0.559 \qquad SE = 0.016 \qquad 1963 \; IV-1978 II$$

Total consumption

PC = C£/C

Deflator for public sector current expenditure on goods and services

$$*\ln PG = \ln PG_{-1} + \underset{(1.0)}{0.00415} + \underset{(1.4)}{0.38939} \; \Delta \ln PIMN + \underset{(0.3)}{0.08621} \; \Delta \ln PIMN_{-1}$$

$$+ \underset{(3.2)}{0.5205} \; \Delta \ln \left[ULC(WSN/WS) \right] + \underset{(1.7)}{0.92515} \; \Delta \ln (1+NETX)_{-1}$$

$$\bar{R}^2 = 0.58 \qquad SE = 1.6 \qquad DW = 2.5 \qquad 1966 \; I-1976 \; I$$

Deflators for fixed investment

Public

$$\Delta \ln \text{PIFG} = 0.60279 \,\Delta\ln \text{PIMO} + 0.35976 \,\Delta\ln \text{ULC} + 0.00923 \,\Delta\ln \text{UMC}$$
$$(4.5) \qquad\qquad (3.3) \qquad\qquad (0.2)$$
$$+ 0.06094 \,\text{D731}$$
$$(3.8)$$

$$\bar{R}^2 = 0.493 \qquad \text{SE} = 0.0154 \qquad \text{DW} = 2.1 \qquad 1963 \,\text{III}-1978\,\text{II}$$

Plant and machinery in manufacturing

$$\ln \text{PPMM} = \ln \text{PPMM}_{-1} + 0.32035 \,\Delta\ln \text{PIMO} + 0.54786 \,\Delta\ln \text{PIMO}_{-1}$$
$$(2.1) \qquad\qquad (3.7)$$
$$+ 0.15486 \,\Delta\ln \text{ULC} - 0.00382 \,\Delta\ln \text{UMC} + 0.36127 \,\Delta\ln(1+\text{NETX})$$
$$(2.1) \qquad\qquad (0.1) \qquad\qquad (1.0)$$
$$+ 0.80232 \,\Delta\ln (1+ \text{NETX})_{-1}$$
$$(2.2)$$

$$\bar{R}^2 = 0.75 \qquad \text{SE} = 0.009 \qquad \text{DW} = 1.6 \qquad 1963 \,\text{IV}-1978\,\text{II}$$

Plant and machinery in distribution and services

$$\ln \text{PPMD} = \ln \text{PPMD}_{-1} - 0.05757 + 0.64656 \,\Delta\ln \text{PIMO} + 0.0901 \,\Delta\ln \text{ULC}$$
$$(1.2) \qquad (2.9) \qquad\qquad (.9)$$
$$- 0.03245 \,\Delta\ln \text{UMC} - 0.33929 \ln \text{PPMD}_{-1} + 0.29225 \ln \text{PIMO}_{-1}$$
$$(.8) \qquad\qquad (3.5) \qquad\qquad (2.7)$$
$$- 0.0782 \ln \text{UMC}_{-1} + 0.06509 \ln \text{ULC}_{-1}$$
$$(2.4) \qquad\qquad (1.4)$$

$$\bar{R}^2 = 0.534 \qquad \text{SE} = 0.012 \qquad \text{DW} = 2.0 \qquad 1963 \,\text{III}-1978\,\text{II}$$

Total private non-residential

$$\text{PINP} = \text{INP£}/\text{INP}$$

Total fixed investment

$$\text{PIF} = \text{IF£}/\text{IF}$$

Deflator for stock levels

$$\ln \text{PS} = \ln \text{PS}_{-1} + \sum_{i=0}^{4} A_i \,\Delta\ln \text{PIMO}_{-i} + \sum_{i=0}^{4} B_i \,\Delta\ln \text{PMGA}_{-i}$$

$$A_{0-4} = 0.3548; \quad 0.2210; \quad 0.1186; \quad 0.0477; \quad 0.0081. \quad \Sigma A_i = 0.7502$$
$$(4.3) \qquad (8.1) \qquad (5.9) \qquad (1.5) \qquad (0.3)$$

$$B_{0-5} = 0.1907; \quad 0.0835; \quad 0.0109; \quad 0.0273; \quad 0.0309. \quad \Sigma B_i = 0.2269$$
$$(8.0) \qquad (6.5) \qquad (0.7) \qquad (1.7) \qquad (2.7)$$

$$\bar{R}^2 = 0.873 \qquad \text{SE} = 0.006 \qquad \text{DW} = 1.6 \qquad 1964 \,\text{II}-1978\,\text{II}$$

Deflator for total final expenditure

$$\text{PEF} = \text{EF£}/\text{EF}$$

Deflator for gross domestic product

$$\text{PGDP} = \text{GDP£}/\text{GDPE}$$

Proxies for price expectations

Based on prices

$$PEXP = 100\left[\left(1 + \frac{DE\$E}{100}\right)^{-0.1} \sum_{i=0}^{3} A_i \left(\frac{PIMN}{PIMN_{-1}}\right)^4_{-i} - 1\right]$$

$A_{0-3} = 0.4; \quad 0.3; \quad 0.2; \quad 0.1$

Based on monetary aggregates

$$PEXM = \left[0.4\left(\frac{KM\pounds S_{-1} + DC\pounds S + R\$E_{-1}/E\$EQ_{-1}}{KM\pounds S_{-1}}\right)^4\right.$$
$$\left. + \sum_{i=1}^{3} A_i \left(\frac{KM\pounds S}{KM\pounds S_{-1}}\right)^4_{-i} - 1\right] 100 - 3$$

$A_{1-3} = 0.3; \quad 0.2; \quad 0.1$

Export prices and external competitiveness

103   The export price index for goods other than manufactures and oil
is specified as a function of a combination of relevant price indices,
taken from the imports side on the assumption that the 'law of one
price' prevails for such goods, weighted together by appropriate
export volumes.

104   The unit value of exports of manufactures is determined by UK
wholesale prices and competitor countries' export prices in roughly
equal proportions, though with a somewhat faster adjustment to the
former.   A simple equation then provides the average value index.

105   The price deflator for exports of services is related to that for
imported services and to domestic earnings.   A dummy takes account
of suspected difficulties in measurement at the time of the 1967
devaluation.

106   The other equations for export prices are self-explanatory.

107   Three measures of external competitiveness are formally
identified but only the first of these currently enters into other
equations in the model.   Other measures may play significant roles
without being individually identified here: for example, the ratio
of wholesale prices to import prices enters into the equation for
manufacturing production.

Export prices

Goods, other than manufactures and oil, AVI

$$\text{+ PXNM} = \exp\left\{ \underset{(4.1)}{0.05626} + \underset{(27.5)}{0.819} \ln \left[((0.172 \text{ UVF1.ERUK} \right. \right.$$
$$+ 0.29 \text{ UVF2.ERUK} + 0.187 \text{ UVF3/ERG} + 0.612 \text{ PIMO}).\text{XGFD}$$
$$\left. \left. + \text{UM1M.XGBM})/(\text{XGFD} + \text{XGBM}) \right] \right\}$$

$\bar{R}^2 = 0.93 \qquad \text{SE} = 0.087 \qquad \text{DW} = 1.57 \qquad 1963 \text{ II-1977 III}$

North Sea oil, AVI

$\text{PX2B} = \text{P2B\$.ERUK}$

Other fuel, AVI

$\text{PX2A} = \text{P2A\$.ERUK}$

Total fuel

$$\text{PXG2} = \frac{\text{XG2A}}{\text{XG2}}.\text{PX2A} + \frac{\text{XG2B}}{\text{XG2}}.\text{PX2B}$$

Manufactures

Unit value index

$$\Delta\ln \text{UXGM} = \underset{(3.9)}{0.7644} + \underset{(2.7)}{0.4202}\,\Delta\ln \text{PIMO} + \underset{(5.2)}{0.2358}\,\Delta\ln(\text{PCOM.ERUK})$$
$$- \underset{(3.8)}{0.3469}\,\ln \text{UXGM}_{-1} + \underset{(2.5)}{0.1849}\,\ln \text{PIMO}_{-1}$$
$$+ \underset{(3.9)}{0.184}\,\ln (\text{PCOM.ERUK})_{-1}$$

$\bar{R}^2 = 0.795 \qquad \text{SE} = 0.00936 \qquad \text{DW} = 1.9 \qquad 1964 \text{ I-1978 II}$

Average value index

$$\ln \text{PXGM} = \underset{(3.1)}{-0.00742} + \underset{(165.7)}{0.96152}\,\ln \frac{\text{UXGM}}{100} + \underset{(4.2)}{0.59814}\,u_{-1}$$

$\bar{R}^2 = 0.99 \qquad \text{SE} = 0.005 \qquad 1970 \text{ II-1978 II}$

All goods, excluding fuel, AVI

$$\text{PXGA} = \frac{\text{PXGM (XG-XG2)} + \text{(PXNM-PXGM)(XGFD + XGBM)}}{\text{XG} - \text{XG2}}$$

Total goods, AVI

$$\text{PXG} = \frac{\text{PXGA(XG-XG2)+XG2£}}{\text{XG}}$$

Services, AVI

$$\ln \text{PXS} = \ln \text{PXS}_{-1} + \underset{(7.2)}{0.44585}\,\Delta\ln \text{PMS} + \underset{(3.2)}{0.2054}\,\Delta\ln \text{PMS}_{-1}$$
$$+ \underset{(2.5)}{0.19291}\,\Delta\ln \text{WSU} + \underset{(2.5)}{0.03631}\,\text{D673}$$

$\bar{R}^2 = 0.557 \qquad \text{SE} = 0.0143 \qquad \text{DW} = 2.3 \qquad 1963 \text{ III-1978 II}$

Total, goods and services, AVI

$\text{PX} = \text{X£}/\text{X}$

External competitiveness

Relative normalised unit labour costs

$NULC = MULC/(WULC.ERUK)$

Relative export prices

$COMP = UXGM/(ERUK.PCOM)$

Export profitability

$XPRF = UXGM/PIMO$

Interest rates

108 The pivotal short rate is the end-quarter rate on three-month
deposits with local authorities.   The equation states that this
rate is determined by a combination of the euro-dollar rate,
with a weight of one half, price expectations, both price and
money-based, with a combined weight of one fifth, plus a constant.
Furthermore, the rate is influenced by changes in the foreign exchange
reserves over the past year - reserve increases tending to lower the
interest rate - and by pressure on the exchange rate such that when,
for example, upward pressure develops the interest rate eases, but in
a non-linear fashion.

109 The long-term UK interest rate in the model is the yield on 20-year
government stocks.   The estimated equation relates this rate to the
short rate, price-based inflationary expectations, the scale of the PSBR
- the effect being more marked from early 1976 onwards - and a constant.

110 Building society interest rates are modelled in the following
manner.   Pressure on the share rate is related to the extent to
which the rate is out of line, for standard rate income tax payers,
with other short rates and to the time that has elapsed since the
share rate was last changed (this captures a reluctance to change
too often);   there is a dummy for the period when the building
societies received a special loan from the Government.   Only when
pressure crosses a certain threshold does the net share rate change.
The extent of such a change depends on competing rates.

111 The margin by which the mortgage rate exceeds the cost of
funds to the societies (the share rate grossed up by the composite
tax rate) depends on the margin between the grossed-up share rate and

other short rates.   This mechanism means that the societies will adjust their lending rates in the direction that tends to narrow any gap between the returns on mortgage lending and on remaining liquid. (An alternative hypothesis, that the societies would be content with lower margins on lending, the higher were their margins on remaining liquid, and vice versa, is rejected by the evidence, since it would imply the opposite sign.)   The equation also has a negative time trend, probably depicting increased efficiency, and a dummy for government intervention.

Interest rates

Local authority three-month deposit rate

End-quarter

$$RLAE = 0.5\ REUE + 0.2\ (0.5\ PEXM + 0.5\ PEXP)$$

$$- 0.25 \sum_{i=0}^{3} A_i \left\{ \frac{R\$.ERUK}{2.222\ GDP\pounds} \right\}_{-i} - 0.2(PERK - \tan^{-1}(PERK)) + 4$$

$$A_{0-3} = 0.4;\quad 0.3;\quad 0.2;\quad 0.1$$

Quarterly average

$$RLA = (RLAE + RLAE_{-1})/2$$

Yield on 20-year government stock

$$RUKG = 5.36223 + 0.21337\ PEXP + 0.18818\ D75A_{-4} \sum_{i=0}^{3} A_i \left[\frac{100\ PSBR}{GDP\pounds} \right]_{-i-1}$$

$$+ 0.15375(1-D75A_{-4}) \sum_{i=0}^{3} A_i \left\{ \frac{100\ PSBR}{GDP\pounds} \right\}_{-i-2} +0.27526\ RLA$$
$$\quad\quad (3.3) \quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad (6.7)$$

$$A_{0-3} = 0.4;\quad 0.3;\quad 0.2;\quad 0.1$$

$$\bar{R}^2 = 0.953 \qquad SE = 0.6 \qquad DW = 1.6 \qquad 1969\ I\ -\ 1977\ IV$$

Yield gap

$$DRLS = RUKG - RLA$$

Minimum lending rate

$$RLB = RLA + 0.5$$

Three-month sterling certificates of deposit

$$RCD = RLA$$

Clearing banks' base rate

$$RCBR = RLB_{-1} + 0.5$$

Three-month euro-dollar rate (quarterly average)

$$REU\$ = (REUE + REUE_{-1})/2$$

Building societies

Pressure on share rate

$$PZSP = 0.05493 + 0.12727 \ (RSN_{-1} - RLAE.(1 - TRY/100))$$
$$ (0.2) (2.1)$$

$$+ \ 0.18116 \ QVAR - 0.73289 \ DLON$$
$$ (3.6) (3.6)$$

$\bar{R}^2 = 0.523$ SE = 0.96   DW = 1.9   1972 I - 1978 II
(estimated with PZSN as dependent variable)

$PZSN = 0$ for $|PZSP| < 0.33$ $PZSN = 1$ for $|PZSP| > 0.33$

Net share rate, end-quarter

$$RSN = RSN_{-1} + \left[0.11888 - 0.24694 \ RSN_{-1} - RLAE(1-TRY/100) \right] PZSN$$
$$\phantom{RSN = RSN_{-1} + [} (3.1) (11.4)$$

$\bar{R}^2 = 0.48$ SE = 0.09   1958 I - 1978 II

Net share rate, quarterly average

$$RZSN = (RSN + RSN_{-1})/2$$

Gross share rate, end-quarter

$$RSG = RSN / \left[1 - \frac{TRY}{100} \right]$$

Gross share rate, quarterly average

$$RZSG = (RSG + RSG_{-1})/2$$

Gross mortgage rate, end quarter

$$RMG = \frac{RSN}{1 - TCR/100} + 1.18026 - 0.00014 \ TIME$$
$$\phantom{RMG = \frac{RSN}{1 - TCR/100} +} (19.3) (0.1)$$

$$- \ 0.01868 \left(\frac{RSN}{1-TCR/100} - RLAE \right) - 0.60455 \ (D731 + D731_{-1})$$
$$ (1.1) (3.5)$$

$\bar{R}^2 = 0.111$ SE = 0.238   DW = 1.4   1957 II - 1978 II

Gross mortgage rate, quarter average

$$RZMG = (RMG + RMG_{-1})/2$$

Personal sector income and expenditure

112 Earlier sections have described wage rates, consumption and
investment.   This section covers the remainder of the income-
expenditure account of the personal sector.   There are a large
number of equations under this heading: the vast majority are very
straightforward - for instance, earned income is derived by
multiplying average earnings by numbers employed - or of a merely
technical nature.   Many technical equations are used to describe the
tax and social security systems which, partly for convenience, are
dealt with at a fairly high level of disaggregation.   The various
tax bands and rates of social security contributions and receipts
are shown as subject to annual indexation - the former linked to
past price movements and the latter to past movements in usual
earnings.   This is the form of the model which is used for
simulation and for forecasts where no contrary policy indication is
available.   It is not, of course, a form which necessarily tracks
the past particularly well.

113 A few individual equations in this section deserve some comment.
Receipts of rent, dividends and gross interest, other than from
building societies or home ownership, are related to companies'
dividend payments, interest payments on public sector debt and a term
proxying interest received on bank deposits; dummies refer to timing
distortions caused by certain past changes to the corporate tax
structure.   Within this total, rent, other than the imputed rent of
owner-occupiers, is separately identified, depending on house prices
and on the residual between rent income in the economy as a whole and
owner-occupiers' imputed rent.

114 In order to derive net receipts of interest and dividends by the
personal sector, an equation is included for gross interest payments,
which are a function of mortgage interest payments and a term
proxying interest paid to banks.

115 The imputed rent of owner-occupiers is dependent on total rent
income in the economy, new house prices and the proportion of
dwellings that are owner-occupied.   This proportion is in turn a
function of the ratio of new houses built for the private sector to
the total, together with a trend term which picks up past changes in
the tenure of existing dwellings.

116 Employers' contributions, other than for national insurance, are specified to rise over time slightly faster than earnings, reflecting growing coverage. They are also greater, at a given level of earnings, the higher the rate of unemployment, probably because unemployed persons on average are less likely to be, or to have been, members of private schemes.

117 Income from public sector current grants is modelled in such a way that 'initial', exogenous, mutually consistent series for earnings, unemployment and grants (respectively WSU&, LU& and YJG&) can be taken, and the model can then be allowed to iterate away from the initial series for grants on the basis of the model's own, endogenous series for earnings and unemployment.

118 Tax payments and national insurance contributions are obtained, broadly speaking, by applying various rates to appropriate income flows or numbers of persons. Disposable income is thus determined and, the volumes of consumption and investment and their price deflators having already been calculated, real income, saving and the net acquisition of financial assets follow.

Personal sector income and expenditure

Miscellaneous variables in the determination of income

Rate of unemployment benefit

$$RUB = (Q2+Q3)RUB_{-1} + Q1.RUB_{-2}\left[1 + 0.5\left(\frac{WSU_{-3} - WSU_{-7}}{WSU_{-7}}\right)\right.$$

$$\left. + \frac{WSU_{-4} - WSU_{-8}}{WSU_{-8}}\right) \right] + Q4.RUB_{-1}\left[1 + 0.25\left(\frac{WSU_{-2} - WSU_{-6}}{WSU_{-6}}\right)\right.$$

$$\left. + \frac{WSU_{-3} - WSU_{-7}}{WSU_{-7}}\right)\right]$$

Ratio of rate of other current grants to initial estimate

$$RJGO = (Q2+Q3)RJGO_{-1} + Q1.RJGO_{-2}\left[(1+0.5\left(\frac{WSU_{-3} - WSU_{-7}}{WSU_{-7}}\right.\right.$$

$$\left. + \frac{WSU_{-4} - WSU_{-8}}{WSU_{-8}}\right)) / (1+0.5\left(\frac{WSU\&_{-3} - WSU\&_{-7}}{WSU\&_{-7}} + \frac{WSU\&_{-4} - WSU\&_{-8}}{WSU\&_{-8}}\right))\right]$$

$$+ Q4.RJGO_{-1}\left[(1+0.25\ \frac{WSU_{-2} - WSU_{-6}}{WSU_{-6}} + \frac{WSU_{-3} - WSU_{-7}}{WSU_{-7}})\right.$$

$$\left. / (1+0.25\left(\frac{WSU\&_{-2} - WSU\&_{-6}}{WSU\&_{-6}} + \frac{WSU\&_{-3} - WSU\&_{-7}}{WSU\&_{-7}}\right))\right]$$

Ratio of owner-occupied to total dwellings

$$\text{ROOT} = \text{ROOT}_{-1} + \underset{(1.2)}{0.00128} + \underset{(2.3)}{0.00469} \left[\frac{\sum_{i=0}^{4} \text{IHP}_{-i}}{\sum_{i=0}^{4} (\text{IHP} + \text{IHG})_{-i}} \right] - \underset{(6.7)}{0.0000327} \text{ TIME}$$

$\bar{R}^2 = 0.45 \qquad SE = 0.0006 \qquad DW = 1.7 \qquad 1964I\text{-}1978II$

Income/receipts (pre-tax)

Wages and salaries

$\text{YWS} = \text{WS.LE}/1000$

Forces' pay

$\text{YFP} = \text{LHMF.WFP}$

Self-employed

$\text{YSE} = \text{LSE.WSE}$

Rent, dividends and gross interest, other than from building societies or home ownership.

$$\text{YHOO} - 0.6 \text{ ECDV} = \underset{(14.6)}{171.59} + \underset{(0.2)}{0.36295} \text{ EDBT}$$

$$+ \underset{(5.7)}{0.0007} (\text{RCBR-2}) \frac{1}{2} \sum_{i=0}^{1} (\text{NLAJ} + \text{KBMS} - \text{KZSD})_{-i}$$

$$+ \underset{(2.4)}{112.36} \quad (\text{D661} - 0.33\text{D661}_{-1} - 0.5\text{D661}_{-2} + 0.17\text{D661}_{-3})$$

$$- \underset{(3.3)}{110.31} \quad (\text{D72C} + \text{D72C}_{-1} + \text{D72C}_{-3})$$

$\bar{R}^2 = 0.946 \qquad SE = 55.8 \qquad DW = 1.5 \qquad 1963II\text{-}1978II$

Gross interest <u>payments</u>

$$\text{EIP} = \text{EIP}_{-1} - \underset{(1.7)}{3.1351} + \underset{(15.2)}{1.6201} \, \Delta \quad \text{LMZI}$$

$$+ \underset{(5.2)}{0.00103} . \, \Delta \, ((\text{RCBR} + 3) \, \tfrac{1}{2} \sum_{i=0}^{1} \text{KBMS}_{-i})$$

$\bar{R}^2 = 0.859 \qquad SE = 12.74 \qquad DW = 2.3 \qquad 1963III\text{-}1978II$

Rent, other than imputed rent of owner-occupiers

$$\text{YRJO} = (\text{YR-ORNT}) . \left[\underset{(6.4)}{0.09644} + \underset{(13.2)}{34.943} / (\text{YR-ORNT}) \right.$$

$$+ \underset{(2.8)}{47.360} \quad \text{PIHF} / (\text{YR-ORNT}) + \underset{(4.2)}{0.52175} \, u_{-1} \left. \right]$$

$\bar{R}^2 = 0.964 \qquad SE = 0.007 \qquad 1963II\text{-}1976I$

Imputed rent of owner-occupiers

$$\ln \text{ORNT} = \ln \text{YR} + 0.02689 + 1.26737 \ln \text{ROOT}$$
$$\qquad\qquad (0.3) \qquad\quad (9.4)$$
$$\qquad + 0.04264 \ln \text{PNH}$$
$$\qquad\qquad (2.9)$$
$$\bar{R}^2 = 0.962 \qquad \text{SE} = 0.018 \qquad \text{DW} = 0.4 \qquad 1964\text{I}-1977\text{IV}$$

Total rent

$$\text{YRJ} = \text{ORNT} + \text{YRJO}$$

Dividends and net interest

$$\text{YDIJ} = \text{YHOO} - \text{EIP} + \text{YVO} + \text{LZSI}/(1 - \frac{\text{TCR}}{100}) - \text{YRJO}$$

"Other" income

$$\text{YJO} = \text{YRJ} + \text{YSE} + \text{YDIJ} + \text{ECCH}$$

Employers' contributions: other than national insurance

$$\ln \text{YECO} = 1.24021 + \ln \frac{(\text{YWS} + \text{YFP})}{100} + 0.06198 \ln \text{UR}$$
$$\qquad\qquad (22.0) \qquad\qquad\qquad\qquad (1.3)$$
$$\qquad + 0.0065 \text{ TIME} + 0.78724 \text{ } u_{-1}$$
$$\qquad\qquad (5.0) \qquad\qquad (9.9)$$
$$\bar{R}^2 = 0.964 \qquad \text{SE} = 0.032 \qquad 1960\text{II}-1978\text{II}$$

Total employers' contributions

$$\text{YEC} = \text{YECN} + \text{YECO}$$

Income from wages, salaries and private pension schemes

$$\text{YJTW} = \text{YWS} + \text{YFP} + \text{YECO} - \text{LVJ} + \text{YVO}$$

Income from public sector current grants

$$\text{YJG} = \text{RJGO.YJG\&} + 0.013 \text{ RUB (LU} - \text{LU\&})$$

Total pre-tax income

$$\text{YJ} = \text{YWS} + \text{YFP} + \text{YEC} + \text{YJG} + \text{YJO}$$

Income tax rates, allowances and coverage

Basic rate on income subject to full earned income relief

$$\text{TRYE} = \text{TRY}(1 - \frac{2}{9}(1-\text{D73B}))$$

Average higher rate

$$\text{TRYU} = \text{Q2.TRYU}_{-4}(1 - (\text{PC}_{-1} - \text{PC}_{-5})/\text{PC}_{-5}) + (1-\text{Q2}) \text{ TRYU}_{-1}$$

Single allowance

$$\text{RTAS} = \text{Q2.RTAS}_{-4}(1 + (\text{PC}_{-1} - \text{PC}_{-5})/\text{PC}_{-5}) + (1-\text{Q2})\text{RTAS}_{-1}$$

Married allowance

$$\text{RTAM} = \text{Q2.RTAM}_{-4}(1 + (\text{PC}_{-1} - \text{PC}_{-5})/\text{PC}_{-5}) + (1-\text{Q2}) \text{ RTAM}_{-1}$$

Average child allowance

$$\text{RTAC} = \text{Q2.RTAC}_{-4}(1 + (\text{PC}_{-1} - \text{PC}_{-5})/\text{PC}_{-5}) + (1-\text{Q2}) \text{ RTAC}_{-1}$$

Numbers claiming married and single allowances

$$\ln (1.45 \text{ NTAM} + \text{NTAS}) = \ln (1.45 \text{ NTAM} + \text{NTAS})_{-4}$$

$$+ \ln ((\text{LE} + \text{LHMF} + \text{LSE})/(\text{LE} + \text{LHMF} + \text{LSE})_{-4})$$

Numbers claiming single allowances

$$\ln \text{NTAS} = \ln \text{NTAS}_{-4} + \ln ((1.45 \text{ NTAM} + \text{NTAS})/(1.45 \text{ NTAM} + \text{NTAS})_{-4})$$

Numbers claiming child allowance

$$\ln \text{NTAC} = \ln \text{NTAC}_{-4} + \ln ((1.017 \text{ NTAM} + 0.096 \text{ NTAS})/$$

$$(1.017 \text{ NTAM} + 0.096 \text{ NTAS})_{-4})$$

Aggregate value of allowances

$$\text{MSCR} = \text{RTAM.NTAM} + \text{RTAS.NTAS} + \text{RTAC.NTAC}$$

$$+ 0.82 \text{ RTAS} (0.45 \text{ NTAM}) (1 - \frac{2}{9} (1 - \text{D73B}))$$

Implicit average tax rate on household income exlcuding current grants

$$\text{RHT} = 100 (\text{TYJ} - \text{TGG} - \text{TYV})/\text{YJT}$$

Proxies for taxable incomes and related items

Self-employment income

$$\text{YSET} = \text{YSE} - \text{DEPJ} - \text{STKJ}$$

Self-employment income on which tax payable in current quarter

$$\text{YSEL} = \sum_{i=5}^{9} w_i \text{ YSET}_{-i}$$

$$W_{5-9} = 0.05; \quad 0.20; \quad 0.50; \quad 0.20; \quad 0.05$$

Personal sector depreciation allowances

$$\text{DEPJ} = 0.65 (0.15 \text{ INP£})$$

Personal sector stock relief

$$\text{STKJ} = \text{D73S} (\text{IIJ£} + \text{YSAJ} - 0.1 (\text{YSE} - 0.75 (\text{EIP} - 1.12 \text{LZMI})))$$

$$+ \text{D75A} (\text{IIJ£} + \text{YSAJ} - 0.15 (\text{YSE} - 0.75 (\text{EIP} - 1.12 \text{LZMI}) - \text{DEPJ}))$$

Receipts of rent, dividends and gross interest (not taxed at source) on which tax payable in current quarter

$$\text{YHOL} = \sum_{i=5}^{9} W_i (\text{YHOO} - 0.6 \text{ ECDV})_{-i}$$

$$W_{5-9} = 0.05; \quad 0.20; \quad 0.50; \quad 0.20; \quad 0.05$$

Total taxable income

$$\text{YJT} = \text{YJTW} + \text{YSEL} + \text{YHOL} + \text{LZSI}/(1 - \frac{\text{TCR}}{100}) + 0.6 \text{ ECDV}$$

Taxable income less allowances

$$\text{YJTU} = \text{YJT} - \text{MSCR}$$

Income tax payments

Proxy for basic rate tax

$$TYJC = YJTW.\frac{TRYE}{100} + YSEL.\frac{TRYE_{-3}}{100} + YHOL.\frac{TRY_{-3}}{100}$$

$$- 0.9 \; MSCR.\frac{TRY}{100}$$

$$- 0.9 \; \frac{TRYE}{100} (1.12 \; LZMI + DTAX(EIP - 1.12 \; LZMI))$$

Taxes on current grants excluding unemployment benefit

$$TGG = TGR \; (YJG - 0.013 \; RUB.LU)/100$$

Proxy for payments of surtax and higher rate tax

$$TYJU = TRYU \; (WS - MSCR/0.001LE).YJTU/100$$

Proxy for payments of investment income surcharge

$$TYJI = \frac{TRYK}{100} \left\{ \frac{400}{4} \frac{(1 + \sum_{i=5}^{9} W_i \left[YHOO + \frac{LZSI}{1-\frac{TRY}{100}} \right]_{-i} - 873.5)}{873.5} \right\}$$

$$+ \frac{TRYI}{100} \left\{ \frac{910}{4} \frac{(1 + \sum_{i=5}^{9} W_i \left[YHOO + \frac{LZSI}{1-\frac{TRY}{100}} \right]_{-i} - 873.5)}{873.5} \right\}$$

$$W_{5-9} = 0.05; \quad 0.20; \quad 0.50; \quad 0.20; \quad 0.05$$

Reduction in tax due to reduced-rate band

$$TARR = Q2.TARR_{-4} \left\{ 1 + \frac{PC_{-1}(1.45NTAM+NTAS) - PC_{-5}(1.45NTAM_{-4}+NTAS_{-4})}{PC_{-5}(1.45NTAM_{-4}+NTAS_{-4})} \right\}$$

$$+ (1-Q2)TARR_{-1} \left(\frac{1.45NTAM+NTAS}{1.45NTAM_{-1}+NTAS_{-1}} \right)$$

Total payments

$$TYJ = TGG + TYV + \frac{LZSI}{\left[\frac{1-TCR}{100} \right]} . \frac{TCR}{100} + \frac{0.6((1-D73A).TRY.ECDV + ACTP)}{100}$$

$$+ 0.3 \; TYJU + TYJI + 388.10 + 0.65031 \; TYJC$$
$$\qquad\qquad\qquad\qquad (5.2) \qquad\quad (34.9)$$

$$- 1.0 \; TARR - 214.81 \; DRE1 - 199.79 \; DRE2$$
$$\qquad\qquad (3.9) \qquad\qquad (3.4)$$

$$\bar{R}^2 = 0.990 \qquad SE = 100.6 \qquad DW = 2.1 \qquad 1965II\text{-}1978II$$

National insurance rates of contribution and related items (see
part 3 for definitions)

$$RFE = Q2.RFE_{-4}\left\{1 + \frac{WSU_{-1} - WSU_{-5}}{WSU_{-5}}\right\} + (1-Q2)\ RFE_{-1}$$

$$RFJ = Q2.RFJ_{-4}\left\{1 + \frac{WSU_{-1} - WSU_{-5}}{WSU_{-5}}\right\} + (1-Q2)\ RFJ_{-1}$$

$$RFSJ = Q2.RFSJ_{-4}\left\{1 + \frac{WSU_{-1} - WSU_{-5}}{WSU_{-5}}\right\} + (1-Q2)\ RFSJ_{-1}$$

$$G3AE = Q2.G3AE_{-4}\left\{1 + \frac{WSU_{-1} - WSU_{-5}}{WSU_{-5}}\right\} + (1-Q2)\ G3AE_{-1}$$

$$G3AL = Q2.G3AL_{-4}\left\{1 + \frac{WSU_{-1} - WSU_{-5}}{WSU_{-5}}\right\} + (1-Q2)\ G3AL_{-1}$$

$$G3S = Q2.G3S_{-4}\left\{1 + \frac{WSU_{-1} - WSU_{-5}}{WSU_{-5}}\right\} + (1-Q2)\ G3S_{-1}$$

$$GIE = Q2.GIE_{-4}\left\{1 + \frac{WSU_{-1} - WSU_{-5}}{WSU_{-5}}\right\} + (1-Q2)\ GIE_{-1}$$

$$GIJ = Q2.GIJ_{-4}\left\{1 + \frac{WSU_{-1} - WSU_{-5}}{WSU_{-5}}\right\} + (1-Q2)\ GIJ_{-1}$$

$$GISJ = Q2.GISJ_{-4}\left\{1 + \frac{WSU_{-1} - WSU_{-5}}{WSU_{-5}}\right\} + (1-Q2)\ GISJ_{-1}$$

$$CIE = Q2.CIE_{-4}\left\{1 + \frac{WSU_{-1} - WSU_{-5}}{WSU_{-5}}\right\} + (1-Q2)\ CIE_{-1}$$

$$CIJ = Q2.CIJ_{-4}\left\{1 + \frac{WSU_{-1} - WSU_{-5}}{WSU_{-5}}\right\} + (1-Q2)\ CIJ_{-1}$$

$$G3E = GRDE\ \left(\frac{(YWS+YFP)/(0.013)(LE+LHMF))}{G3AE}\right)$$

$$G3J = 0.013\ (LE+LHMF)\ ((1-NECO/(LE+LHMF))$$

$$(GIJ+0.01\ GRJ\ (\frac{YWS+YFP}{0.013(LE+LHMF)}))$$

$$+\ (NECO/(LE+LHMF))(CIJ+0.01\ CRJ(\frac{YWS+YFP}{0.013(LE+LHMF)})))$$

$$(\frac{(YWS+YFP)/(0.013(LE+LHMF)}{G3AL})$$

$$+\ 0.013\ LSE\ (GISJ+0.01\ GRS\ (\frac{YSE}{0.013LSE}))$$

$$(\frac{YSE/(0.013LSE)}{G3S})$$

National insurance contributions

Flat rate: employers

$$FLTE = RFE \ (0.013(LE+LHMF))$$

Flat rate: employees and self-employed

$$FLTJ = RFJ \ (0.013(LE+LHMF))+RFSJ \ (LSE)$$

Graduated: employees

$$GRDE = 0.013 \ (LE+LHMF)(1-NECO/(LE+LHMF))$$

$$(GIE + 0.01 \ GRE \ (\frac{YWS+YFP}{0.013(LE+LHMF)}))$$

$$+ \ (NECO/(LE+LHMF))(CIE+0.01 \ CRE \ (\frac{YWS+YFP}{0.013(LE+LHMF)}))$$

Graduated : employees and self-employed

$$GRDJ = 0.013 \ (LE+LHMF)((1-NECO/(LE+LHMF))$$

$$(GIJ + 0.01 \ GRJ \ (\frac{YWS+YFP}{0.013(LE+LHMF)}))$$

$$+ \ (NECO/(LE+LHMF))(CIJ+0.01 \ CRJ(\frac{YWS+YFP}{0.013(LE+LHMF)}))$$

$$+ \ 0.013 \ LSE \ (GISJ + 0.01 \ GRS \ (YSE/(0.013 \ LSE)))$$

Total: employers

$$YECN = 0.71507 \ FLTE + 1.0098 \ GRDE - 0.26298 \ G3E$$
$$\quad (59.5) \qquad\quad (29.7) \qquad\quad (5.0$$

$$+ \ 21.272 \ D741 + 14.081 \ (-D71A+D71A_{-1})$$
$$\quad (1.0) \qquad\quad (1.0)$$

$$\bar{R}^2 = 0.998 \qquad SE = 20.16 \qquad DW = 1.3 \qquad 1963II-1978II$$

Total: employees and self-employed

$$YJCN = 0.70935 \ FLTJ + 1.0141 \ GRDJ - 0.30084 \ G3J$$
$$\quad (71.4) \qquad\quad (27.8) \qquad\quad (6.4)$$

$$+ \ 4.5345 \ D741 + 14.484 \ (-D71A+D71A_{-1})$$
$$\quad (0.4) \qquad\quad (1.9)$$

$$\bar{R}^2 = 0.997 \qquad SE = 10.9 \qquad DW = 1.1 \qquad 1961I-1976III$$

Grand total

$$ENIH = YECN + YJCN$$

Disposable income, saving and acquisition of financial assets

Disposable income

$$YD = YJ-EJTA-TYJ-EN1H$$

Saving

$$SJ = YD-C\mathcal{S}$$

Saving ratio

$SR = 100.SJ/YD$

Real disposable income

$RPDI = YD/PC$

Proxy for permanent non-grant income

$$YDPM = \frac{0.3 \sum\limits_{i=0}^{12} (1-0.3)^i \left[\frac{YD-YJ}{PC} \right]_{-i}}{0.3 \sum\limits_{i=0}^{12} (1-0.3)^i}$$

Proxy for permanent non-grant real disposable income

$YCDL = 0.3 \, (YD-YJG)/PCD + 0.7YCDL_{-1}$

Net acquisition of financial assets

$FJ = SJ+FTKJ-(IFJ\pounds+IIJ\pounds+YSAJ)$

Company sector income and expenditure

119 This section covers those income and expenditure items in the
company sector that have not yet been mentioned.   In several cases, the
company sector acts as the residual category in inter-sectoral flows.
Thus, gross trading profits are arithmetically determined as the
difference between GDP and all the other factor incomes that have been
identified; and payments of 'other' dividends and interest form
technically a residual category, though some of the elements determining
it are exogenous.

120 There are estimated equations for rent and non-trading income,
which are related to GDP, and for tax payments, which are related to
relevant taxable flows and the appropriate prevailing tax structures
(e.g. taking account of the switch to corporation tax) and tax rates.

121 Within the company sector, certain items are identified separately
for financial companies (i.e. banks and other financial institutions),
to enable the net acquisition of financial assets by industrial and
commercial companies alone to be calculated.   Changes in the gross
trading profits of financial companies are an estimated function of
changes in GDP, interest rates and time.   Their interest payments,

as a proportion of final sales in the economy, are a function of past interest rates, and their receipts of rent and non-trading income are modelled in a similar fashion.

<center>Company sector income and expenditure</center>

Income/receipts (pre-tax)

Gross trading profits

$$YCTP = GDP\pounds + YSA - YWS - YEC - YGTA - YRSE - RESE - YFP$$

Gross trading profits less stock appreciation

$$YCTR = YCTP - YSAC$$

Rent and non-trading income

$$*YCNT = YCNT_{-1} - \underset{(0.6)}{1.6656} + \underset{(12.4)}{0.89678} \, \Delta \, YCNT_{-1} + \underset{(2.3)}{0.02923} \, \Delta(GDP_{-1}.\Delta \, PGDP)$$

$$- \underset{(1.0)}{0.01007} \, \Delta^2 \, GDP + \underset{(2.2)}{0.03091} \, \Delta GDP - \underset{(2.0)}{0.29781} \, u_{-1}$$

$$\bar{R}^2 = 0.61 \qquad SE = 17.3 \qquad 1958 \, III - 1974 \, II$$

Income from abroad

$$YCAB = 0.975 \, YYUP + 0.42 \, YYSR + YYOL + 0.65 \, YYXC + YYBE + 0.825 \, YY\pounds R$$

Total income

$$YC \quad = YCTP + YCNT + YCAB$$

Taxation

Stock relief

$$STKR = (IIC\pounds + YSAC - 0.1 \, (YCTP-ECOI)) \, D73S$$
$$+ \, (IIC\pounds + YSAC - 0.15 \, (YCTP-ECOI-ACC)) \, D75A$$

Proxy for payments of income tax

$$ECT1 = 0.0025.TRYC \quad (\sum_{i=5}^{8} \, (YCTP + YCNT - ACC)_{-i} \quad Q1$$

$$+ \, \sum_{i=6}^{9} \, (YCTP + YCNT - ACC)_{-i} \quad Q2$$

$$+ \, \sum_{i=7}^{10} \, (YCTP + YCNT - ACC)_{-i} \quad Q3$$

$$+ \, \sum_{i=8}^{11} \, (YCTP + YCNT - ACC)_{-i} \quad Q4) \quad - \frac{TRY}{100} \, (ECOI + ECDV)$$

Proxy for payments of mainstream corporation tax

$$ECT2 = 0.25 \left[\sum_{i=5}^{8} (TRYC_{-i}/100)(YCTP + YCNT - ACC - ECOI - STKR)_{-i} \; Q1 \right.$$

$$+ \sum_{i=6}^{9} (TRYC_{-i}/100)(YCTP + YCNT - ACC - ECOI - STKR)_{-i} \quad Q2$$

$$+ \sum_{i=7}^{10} (TRYC_{-i}/100)(YCTP + YCNT - ACC - ECOI - STKR)_{-i} \quad Q3$$

$$\left. + \sum_{i=8}^{11} (TRYC_{-i}/100)(YCTP + YCNT - ACC - ECOI - STKR)_{-i} \quad Q4 \right]$$

$$- 0.25 \; D75A \left[\sum_{i=4}^{7} (RACT.ECDV)_{-i} \quad Q1 + \sum_{i=5}^{8} (RACT.ECDV)_{-i} \quad Q2 \right.$$

$$\left. + \sum_{i=6}^{9} (RACT.ECDV)_{-i} \quad Q3 + \sum_{i=7}^{10} (RACT.ECDV)_{-i} \quad Q4 \right]$$

Combined proxy

$$ECT3 = ECT1 \; (1-D67B) + ECT2.D67B$$

Payments of income tax or mainstream corporation tax

$$TYCM = 16.904 \quad + 1.0379 \; ECT3 + 50.738 \cdot D667$$
$$\quad\quad (1.0) \qquad\quad (16.8) \qquad\quad\quad (3.1)$$

$$+ 129.5 \; (-D71A + D71A_{-1}) + 92.410 \quad D722$$
$$\quad (4.3) \qquad\qquad\qquad\qquad (2.1)$$

$$\bar{R}^2 = 0.899 \qquad SE = 42.9 \qquad DW = 1.80 \qquad 1964 \; I - 1974 \; II$$

Payments of advance corporation tax

$$ACTP = (RACT.ECDV)_{-1} \; .D73A$$

Total direct tax payments

$$TYC \;\; = TYCM + ACTP + ECPT - OSP + ACTS + TPR$$

Other payments, and total

'Other' dividends and interest

$$ECOI = YCAB + YCNT - ECDV - ECAB - ACTC + YGRA - EDBT + YDIJ$$
$$\quad\quad + ECCH - TOJ + TYO - BYPA - YR + YRJ$$

Profits due abroad and taxes paid abroad

$$ECAB = EYUP + EYOL$$

Net capital transfers

$$FTKC = -(FTKG + FTKO + FTKJ)$$

Total current expenditure

$$EC = ECDV + ECOI + ECAB + TYC + ECTA$$

Saving and acquisition of financial assets

Saving

$$SC = YC - EC$$

Net acquisition of financial assets:-

all companies $\quad FC = SC + FTKC - (IFC£ + IIC£ + YSAC)$

industrial and commercial companies $\quad FFI = FC - GTPF - NTIF + OIPF$

Disaggregation for financial companies

Gross trading profits

$$GTPF = 123.56 + 0.86271 \, GTPF_{-1} + 0.01535 \, \Delta \, GDP - 1.9728 \, TIME$$
$$(2.4) \qquad (14.1) \qquad\qquad (1.5) \qquad\qquad (2.2)$$

$$- \; 3.1252 \, RLA$$
$$(2.3)$$

$$\bar{R}^2 = 0.985 \qquad SE = 22.0 \qquad 1968 \; II - 1978 \; II$$

'Other' interest payments

$$\frac{OIPF}{EF£} = 0.00117 \, RLA - 0.00046 \, RLA_{-1} - 0.00045 \, RLA_{-2} + 0.90933 \left(\frac{OIPF}{EF£}\right)_{-1}$$
$$(9.3) \qquad\qquad (2.4) \qquad\qquad (3.1) \qquad\qquad (12.8)$$

$$\bar{R}^2 = 0.968 \qquad SE = 0.001 \qquad 1967 \; II - 1978 \; II$$

Rent and non-trading income

$$\frac{NTIF}{EF£} = 0.00176 \, RLA - 0.00112 \, RLA_{-1} - 0.00047 \, RLA_{-2} + 0.97197 \left(\frac{NTIF}{EF£}\right)_{-1}$$
$$(9.7) \qquad\qquad (4.3) \qquad\qquad (2.4) \qquad\qquad (23.5)$$

$$\bar{R}^2 = 0.97 \qquad SE = 0.002 \qquad 1967 \; II - 1978 \; II$$

Public sector income and expenditure

122   In addition to taxes on expenditure, which are the subject of the next section, there are three items in the public sector's income and expenditure account, for which equations have been estimated, that have not yet been listed.   Gross trading surpluses are related to private sector corporate profits and to the ratio of the factor incomes of the two sectors, which is exogenous, with a dummy representing official price restraint on public corporations.   Income from rent, dividends and interest is related to total rents, the stock of public sector lending and the long-term rate of interest.   Debt interest payments depend on net issues of debt and on relevant interest rates.

Public sector income and expenditure

Gross trading profits

$$YGTA = 1.623 \; (YCTP.RPCC) + DPRG - 53.7$$
$$(52.9) \qquad\qquad\qquad (5.2)$$

$\bar{R}^2 = 0.986 \qquad SE = 36.9 \qquad DW = 1.9 \qquad 1962 \; I - 1977 \; IV$

Income from rent, dividends and net interest

$$YGRA - 0.35 \; YR = 43.763 \quad + 1.3244 \; RUKG + 0.002 \; RUKG.KLNG$$
$$(1.7) \qquad (0.3) \qquad\qquad (3.2)$$

$$+ \; 0.4861 \; u_{-1}$$
$$(3.4)$$

$\bar{R}^2 = 0.9 \qquad SE = 7.9 \qquad 1964 \; I - 1973 \; IV$

Advance corporation tax credits

$$ACTC = (RACT.ECDV) \; D73B$$

Total current receipts

$$YGC = YGTA + YGRA + TYJ + TYC + TYO - ACTC + TE` + ENIH$$

Current expenditure on goods and services

$$G\pounds = G.PG$$

Debt interest payments

$$EDBT = EDBT_{-1} + 0.12 \; EDBT_{-1} \; \left(\frac{\Delta RLA}{RLA_{-1}}\right)$$

$$+ \; \frac{RUKG_{-2}}{400} \; (BLGJ_{-2} + BLGI_{-2} + BLGV_{-2} + BGSO_{-2})$$

$$+ \; \frac{RLA}{400} \; (BSGJ + BSGI + BSGV - IDCG + XOGO)$$

Total current expenditure

$$EGC = G\pounds + ESAB + YJG + EGTA + EDBT$$

Saving

$$SG = YGC - EGC$$

Net acquisition of financial assets

$$FG = SG + FTKG - (IFG\pounds + IIG\pounds + YSAG)$$

Taxes on expenditure

123 The model distinguishes payments of expenditure taxes from
accruals thereof in cases where official statistics make the
distinction.   Tax receipts are described in this section on an
accruals basis, as it is in this form that they enter the national

income accounts.   Accruals adjustments are introduced later, in the flow of funds accounts.   As in the case of personal direct tax allowances and rates for national insurance contributions and receipts, specific indirect taxes are entered in the model in a form that assumes annual revalorisation, in this case in line with the past increase in consumer prices.   Once again it should be noted that this is a format usually employed for simulation and forecasting when no contrary policy indication is available;   it does not purport to portray the past precisely.

124   Motor vehicle duties and local authority rates are modelled by raising past revenue levels to take account of inflation;   the former are also presumed to grow additionally at a steady rate as an approximation for the growth of the vehicle population.   The national insurance surcharge, which is treated as an indirect tax, is calculated as a surcharge on existing contributions.   All other categories of tax on expenditure, of which eight are identified, are modelled by applying tax rates to relevant expenditure variables (or proxies for such).   The equations for value added tax, car tax and North Sea oil and gas royalties are imposed;   the others are estimated.

Taxes on expenditure

Motor vehicle duties

$$TMVD = 1.015\ TMVD_{-4}\ (Q2 \cdot \frac{PC_{-1}}{PC_{-5}} + Q3 \cdot \frac{PC_{-2}}{PC_{-6}} + Q4 \cdot \frac{PC_{-3}}{PC_{-7}} + Q1 \cdot \frac{PC_{-4}}{PC_{-8}})$$

Purchase tax and value added tax (excluding that on cars) - accruals

$$AVAT = D73B\ \frac{VATS}{100 + VATS}\ (CB.PB + CWS.PWS + CT.PT)$$

$$+ \frac{RVHC}{100 + RVHC} \cdot 0.1661(DPPM - 700)\ 0.45\ (\frac{RHCO}{32.5} + 0.652\ PFLO + 0.229)$$

$$(1 + \frac{RVHC}{100}) + \frac{VATS}{100 + VATS}\ (D73S_{-1} + 0.676\ D75A_{-1})CD\pounds$$

$$+ \frac{VATS}{100 + VATS} \cdot IVEH.PVIB$$

$$+ \frac{TRCD}{100 + TRCD}\ \lceil 1 - (D73S_{-1} - 0.676\ D75A_{-1}) \rceil CD\pounds$$

$$+ \frac{TRCD}{100 + TRCD}\ (0.013\ D75A_{-1})\ \lceil CND\pounds - CB.PB - CWS.PWS - CT.PT$$

$$-0.1661(DPPM-700)0.45\left(\frac{RHCO}{32.5} + 0.652\ PFLO + 0.229\right)\left(1 + \frac{RVHC}{100}\right)\bigg]$$

$$+\ 0.40941\ \frac{VATS}{100 + VATS}\ \left[CND\pounds - CB.PB - CWS.PWS - CT.PT\right.$$
$$\quad (74.4)$$

$$-0.1661(DPPM-700)0.45\left(\frac{RHCO}{32.5} + 0.652\ PFLO + 0.229\right)\left(1 + \frac{RVHC}{100}\right)\bigg]$$

$$+\ 0.25\ \frac{VATS}{100 + VATS}\ \ G\pounds\ \ +\ (1 - D73B)\ C\pounds.\frac{RPT}{100}$$

Purchase tax on cars and car tax-accruals

$$ACAR = 1.0025\ \frac{TCAR}{100 + TCAR}\ \ \ 0.47\ CD\pounds$$

Taxes on hydrocarbon oils

Rate

$$RHCO = Q2.RHCO_{-4}\left[1 + \frac{PC_{-1} - PC_{-5}}{PC_{-5}}\right] + (1 - Q2)\ RHCO_{-1}$$

Revenue

$$THCO = 2.95\ RHCO.\frac{DPPM}{1,000} + 1.498\ \frac{DPPO}{1,000}\ (1 + 1.5\ D75A_{-9})$$
$$\qquad\qquad (6.2)$$

$$+\ 0.9221\ RHCO.\frac{DPPM}{1,000}\ \left[(1 - D75A_{-10}) + 1.167\ D75A_{-10}\right] + 1.73$$
$$\quad (16.7) \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad (0.5)$$

$$\bar{R}^2 = 0.96 \qquad SE = 7.6 \qquad DW = 2.4 \qquad 1965\ I - 1978\ II$$

Customs and excise duty on beer

Rate

$$CEDB = Q2.CEDB_{-4}\left[1 + \frac{PC_{-1} - PC_{-5}}{PC_{-5}}\right] + (1 - Q2)\ CEDB_{-1}$$

Revenue

$$TB = 17.784\ \ + 0.01655\ CB.CEDB$$
$$\quad (14.9) \qquad (93.4)$$

$$\bar{R}^2 = 0.99 \qquad SE = 3.8 \qquad DW = 1.7 \qquad 1963\ I - 1978\ II$$

C&E duty on wines and spirits

Rate on wines

$$CEDW = Q2.CEDW_{-4}\left[1 + \frac{PC_{-1} - PC_{-5}}{PC_{-5}}\right] + (1 - Q2)\ CEDW_{-1}$$

Rate on spirits

$$CEDS = Q2.CEDS_{-4} \left[1 + \frac{PC_{-1} - PC_{-5}}{PC_{-5}} \right] + (1 - Q2)\, CEDS_{-1}$$

Revenue

$$TWS = \underset{(23.1)}{0.01463}\, CWS.CEDS + \underset{(6.3)}{0.0378}\, CWS.CEDW$$

$$+ \underset{(10.5)}{18.361}\quad (D763 + 2.5\, D763_{-1} - D763_{-2} - 2.5\, D763_{-3})$$

$$+ \underset{(1.8)}{13.212}\ \ \grave{}\ (D681 - D681_{-1}) + \underset{(2.5)}{18.365}\quad (D703 - D703_{-1})$$

$$+ \underset{(2.0)}{14.954}\cdot\ (D74A - D74A_{-1})$$

$$\bar{R}^2 = 0.983 \qquad SE = 10.4 \qquad SW = 1.8 \qquad 1964\ I - 1978\ II$$

C&E duties on tobacco

Rates

$$CEDT = Q2.CEDT_{-4} \left[1 + \frac{PC_{-1} - PC_{-5}}{PC_{-5}} \right] + (1 - Q2).CEDT_{-1}$$

$$DTNO = Q2.DTNO_{-4} \left[1 + \frac{PC_{-1} - PC_{-5}}{PC_{-5}} \right] + (1 - Q2).DTNO_{-1}$$

Revenue

$$*TT - (0.01\ CT.PT.RDT) = \underset{(125.3)}{0.08456}\ CT.CEDT + \underset{(16.5)}{0.04786}\ CT.DTNO$$

$$\bar{R}^2 = 0.885 \qquad SE = 18.038 \qquad DW = 1.9 \qquad 1963\ I - 1978\ I$$

Local authority rates

$$*TRAT = \underset{(1.2)}{1.524} + \underset{(236.7)}{1.0013}\ TRAT_{-1} \left[1 + (\frac{PG - PG_{-4}}{PG_{-4}}) \right] Q2$$

$$+ \underset{(276.7)}{1.0028}\ TRAT_{-1}\ (1 - Q2)$$

$$\bar{R}^2 = 0.99 \qquad SE = 4.3 \qquad DW = 1.9 \qquad 1959\ I - 1973\ IV$$

National insurance surcharge

$$YECS = \frac{GRES(1.00976\ GRDE - 0.26298\ G3E)}{(1-NECO/(LE + LHMF))GRE + (NECO/(LE + LHMF))CRE}$$

Protective duties

$$*TPRM = -12.949 + 0.02164 \; [PMM \; (MGFM + MGNS) + MGIM.PMIM]$$
$$\qquad\quad (1.5) \qquad (7.2)$$

$$+ 0.51045 \; MSUR \; [PMM \; (MGFM + MGNS) + MGIM.PMIM]$$
$$\quad (14.0)$$

$$+ 0.01956 \; (MGIM + MGFM + MGNS) + 0.21228 \; u_{-1}$$
$$\quad (3.9) \qquad\qquad\qquad\qquad\qquad (1.3)$$

$$\bar{R}^2 = 0.927 \qquad SE = 0.004 \qquad 1965 \; II - 1976 \; III$$

North Sea oil and gas royalties - accruals

$$ANSR = \frac{RNSR}{100} \; (40.5 \; PX2B.NSO)$$

Total taxes on expenditure

TE = TB + TWS + TT + THCO + TRAT + ANSR + TSET + YECS + TPRM

   + ACAR + AVAT + TMVD + TADJ

Net expenditure taxes, exluding North Sea royalties,
 as proportion of final expenditure

$$NETX = \frac{FCA£ - ANSR - YECS - TSET}{EF£}$$

Interest, profits and dividends in the balance of payments

125 Interest, profits and dividends (IPD) are modelled with quite a high
degree of disaggregation by a stock-flow approach.   The various
stock series are modelled on a perpetual inventory basis, which allows
for consistency with the flows in the capital account of the balance
of payments and for the valuation effect of exchange rate movements.
Most IPD flows are then derived by the application of a rate of return
to the appropriate stock.   There are a few exceptions, where the
IPD flow is modelled differently so that the rate of return is, in
effect, the residual: examples are oil, where the IPD flows are
exogenous, and credits from direct private investment overseas, which is
described by the only estimated equation in this sector - the equation
having the stock of assets and the level of world activity as
explanatory variables.

Interest, profits and dividends in the balance of payments

Credits

External asset stock	IPD credit or rate of return

Private direct investment

$$KYUP = KYUP_{-1} \cdot \frac{E\$EQ_{-1}}{E\$EQ} - UNRP$$

$$\ln\left(\frac{YYUP}{PCOM.ERUK}\right) = -7.0362$$
$$(2.6)$$
$$+ 0.5997 \ln TWIP$$
$$(1.4)$$
$$+ 1.19572$$
$$(3.3)$$
$$\ln\left(\frac{KYUP}{PCOM.ERUK}\right)_{-1}$$

$$\bar{R}^2 = 0.381 \quad SE = 0.0707$$

1974 I – 1978 I

$$RYUP = 400.YYUP/KYUP_{-1}$$

Private portfolio

$$KYSR = KYSR_{-1} \cdot \frac{E\$EQ_{-1}}{E\$EQ} \cdot \frac{SPUS}{SPUS_{-1}} - YSR$$

$$YYSR = KYSR_{-1}.RYSR/400$$

Oil

$$KYOL = KYOL_{-1} \cdot \frac{E\$EQ_{-1}}{D\$EQ} - OOIL$$

$$RYOL = 400.YYOL/KYOL_{-1}$$

Export credit

$$KYXC = KYXC_{-1} - EXCB - EXSC$$

$$YYXC = KYXC_{-1}.RRXC.RLA/400$$

Intergovernmental loans by UK

$$KYGL = KYGL_{-1} - ILUK$$

$$YYGL = KYGL_{-1}.RYGL/400$$

Gold reserves

$$KYGG = KYGG_{-1} \cdot \frac{E\$EQ_{-1}}{E\$EQ}$$

–

Other reserves

$$KYRO = KYRO_{-1} \cdot \frac{E\$EQ_{-1}}{E\$EQ} + BOF + EGUK + IMF + HMG + ECB$$

$$YYRO = KYRO_{-1}. REU\$/400$$

Residual sterling claims

$$KY£R = KY£R_{-1} - DE£C - OCSF$$

$$YY£R = KY£R_{-1}.RLA/400$$

Sub-total

$$KYOT = KY£R+KYXC+KYGL+KYGG+KYRO$$

$$YYOT = YY£R+YYXC+YYGL+YYRO+YYBE$$

Total

$$KYT = KYUP + KYSR + KYOL + KYOT$$

$$YYPA = YYUP + YYSR + YYOL + YYOT$$

Debits

External liability stock	IPD debit or rate of return

Private direct investment

$$KEUP = KEUP_{-1} + IDI + OCF \qquad REUP = 400.EYUP/KEUP_{-1}$$

Private portfolio, sterling

$$KES£ = KES£_{-1} + PEO£.OICS \qquad EYS£ = KES£._{-1}RES£/400$$

Private portfolio, foreign currency

$$KES\$ = KES\$_{-1}.\frac{E\$EQ_{-1}}{E\$EQ} \qquad EYS\$ = KES\$_{-1}.REUS/400$$
$$\qquad + (1 - PEO£)\ OICS$$

Public portfolio

$$KEXR = KEXR_{-1} + PEXR.XRS£ \qquad EYXR = KEXR_{-1}.RLA/400$$

Total portfolio

$$KESR = KES£ + KES\$ + KEXR \qquad EYSR = EYS£ + EYS\$ + EYXR$$

Oil

$$KEOL = KEOL_{-1} + IOIL \qquad REOL = 400.EYOL/KEOL_{-1}$$

Miscellaneous private

$$KEMI = KEMI_{-1}.\frac{E\$EQ_{-1}}{E\$EQ} + MII \qquad EYMI = KEMI_{-1}.REU\$/400$$

Import credit, sterling

$$KEM£ = KEM£_{-1} + (1-PEM\$).OIMC \qquad EYM£ = KEM£_{-1}.RRM£.RLA/400$$

Import credit, foreign currency

$$KEM\$ = KEM\$_{-1}.\frac{E\$EQ_{-1}}{E\$EQ} + PEM\$.OIMC \qquad EYM\$ = KEM\$_{-1}.RRM\$.REU\$/400$$

Total import credit

$$KEMC = KEM£ + KEM\$ \qquad EYMC = EYM£ + EYM\$$$

Intergovernment loans to UK

$$KEGL = KEGL_{-1}.\frac{E\$EQ_{-1}}{E\$EQ} + LTCG-ILUK \qquad EYGL = KEGL_{-1}.REGL/400$$

UK banks' external sterling liabilities

$$KEB£ = KEB£_{-1} + OBML + OIPS \qquad EYB£ = KEB£_{-1}.RRB£.RLA/400$$
$$\qquad + (1+PEXR).XRS£$$

UK banks' net foreign currency liabilities

$$KEB\$ = KEB\$_{-1}.\frac{E\$EQ_{-1}}{E\$EQ} + \Delta SWI \qquad REB\$ = 400.EYB\$/KEB\$_{-1}$$
$$\qquad + FCTR + EGUK$$

IMF position

$$KEIM = KEIM_{-1} \cdot \frac{E\$EQ_{-1}}{E\$EQ} + IMF \qquad\qquad EYIM = KEIM_{-1} \cdot REIM/400$$

HMG loan

$$KEHM = KEHM_{-1} \cdot \frac{E\$EQ_{-1}}{E\$EQ} + HMG \qquad\qquad REHM = 400 \cdot EYHM/KEHM_{-1}$$

Exchange cover borrowing

$$KECB = KECB_{-1} \cdot \frac{E\$EQ_{-1}}{E\$EQ} + ECB \qquad\qquad EYCB = KECB_{-1} \cdot REU\$/400$$

Sub-total

$$KEOT = KEMI + KEMC + KEGL + KEB\pounds \qquad EYOT = EYMI + EYMC + EYGL + EYB\pounds$$
$$+ KEB\$ + KEIM + KEHM + KECB \qquad\qquad + EYB\$ + EYIM + EYHM + EYCB$$

Total

$$KET = KEUP + KESR + KEOL + KEOT \qquad EYPA = EYUP + EYSR + EYOL + EYOT$$

Balance of payments current account: summary

126 Transfers are the only element of the current account that
has not yet been discussed.   These are all exogenous.

127 The equations following show the simple summations which produce
the standard aggregates, and there is a straightforward seasonal
equation which provides the current balance on an unadjusted basis.

Balance of payments current account: summary

Visible balance

$$BALV = XG\pounds - MG\pounds$$

Balance of petroleum and petroleum products

$$BPP\pounds = XPP\pounds - MPP\pounds$$

Balance of services

$$BALS = XS\pounds - MS\pounds$$

Net interest, profits and dividends

$$BYPA = YYPA - EYPA$$

Net private and government transfers

$$BTAB = -(EGTA + EJTA + ECTA - TOJ)$$

Invisibles balance

BALI = BALS + BYPA + BTAB

Current balance

BAL = BALV + BALI

Current balance not seasonally adjusted

BALU = BAL + GDP£(-0.00348Q1+0.00152Q2-0.00023Q3+0.00247Q4)-0.31435u
$\qquad$ (5.0) $\qquad$ (2.3) $\qquad$ (0.3) $\qquad$ (3.5) $\qquad$ (2.8) -1

$\bar{R}^2 = 0.381$ $\qquad$ SE = 44.4 $\qquad$ 1958 II - 1978 II

Fourth quarter then constrained by

$$BALU = (1-Q4)\ BALU + Q4\ (\sum_{i=0}^{3} BAL_{-i} - \sum_{i=1}^{3} BALU_{-i})$$

Net acquisition of financial assets by overseas sector

FO = FTKO - BAL

Balance of payments capital account

128 Over twenty types of capital flow, almost all corresponding precisely to categories in the balance of payments accounts, are identified. However, not all gross balance of payments flows are modelled, because in some cases different approaches are suggested by the operation of exchange controls. Thus, surrenders under the 25% rule, and outward direct investment in the form of unremitted profits are identified (the former exogenously), while outward portfolio investment, outward direct investment financed from borrowing abroad, and that borrowing itself, are not. Recent relaxations of exchange controls will necessitate some review of this area. A large number of the flows which are identified are modelled by estimated equations, but some important ones - such as oil investment and exchange reserves in sterling - are exogenous.

129 This is the one full part of the model that is not specified in seasonally-adjusted terms. Most of the equations therefore contain seasonal dummies. The general approach is of stock adjustment. All dependent variables are scaled by some aggregate such as, in the cases of trade credit and the balancing item, trade flows.

130 Other explanatory variables to appear in the various equations are mainly appropriate interest rates, monetary influences and confidence factors. The hypothesis is that certain stocks will be adjusted when

relevant interest rates change, and also that variations in DCE in the United Kingdom will result in some sucking-in or spill-over of certain types of funds from and to overseas. Confidence is proxied in places by shifts in the visible or current balances, and an alternative interpretation of the inclusion of DCE could be as a confidence factor. But the principal confidence variable is that which is labelled CONF: this is the operator which brings balance of payments flows into line with the balance for official financing, as derived from reserve flows (determined by the exchange rate/reserves sector of the model) together with net official borrowing (which is exogenous). In practice, therefore,the equations containing CONF are overridden by the exchange rate sector, save in their role of apportioning a given total flow amongst themselves. The term in CONF has been added after the estimation of each equation.

131 In considering the foreign currency transactions of UK banks (other than for investment abroad), the net position is first obtained by a method which embodies the constraint of exchange control; then net transactions with UK residents are modelled separately; the difference between these two is net transactions with overseas residents, which is the balance of payments entry.

132 Direct private investment overseas that is financed out of unremitted profits is modelled somewhat differently to the main body of equations in this section, being related to the level of profits, world activity and a non-linear time trend.

133 The equation for the balancing item has been developed along the same lines as those for the majority of capital flows, outlined above; but, in addition, it has been found that a change in the balance of trade in non-manufactures, excluding oil, significantly affects the balancing item, in the opposite direction.

Balance of payments capital account

Overseas investment in UK public sector

$$\frac{OIPS}{GDP\pounds/1,000} = 0.52778 + 1.6647 \quad \Delta(RUKG-RUSG) + 4.1417 \; \Delta \; UR$$
$$\hphantom{xxxxxxxxxxxx}(0.7)\hphantom{xx}(1.2)\hphantom{xxxxxxxxxxxxxxxxxxxxxx}(2.0)$$

$$- \; 0.11901 \; Q2 - 1.3838 \quad Q3 + 0.77928 \; Q4 + 17.16 \; \Delta \; CONF$$
$$\hphantom{xx}(0.1)\hphantom{xxxxxxx}(1.3)\hphantom{xxxxxxxx}(0.7)$$

$$\bar{R}^2 = 0.22 \quad SE = 2.29 \quad DW = 1.977 \quad 1964 \; II - 1973 \; II$$

Overseas investment in UK company securities

$$* \frac{OICS}{GDP£/1,000} = \left(\frac{OICS}{GDP£/1,000}\right)_{-1} + \underset{(0.7)}{0.05126} \ \Delta^2 \left(\frac{PCUS.ERUK}{PC}\right)$$

$$+ \underset{(3.0)}{0.07256} \ \Delta^2 \left(\frac{BALV}{GDP£/1,000}\right) + \underset{(1.9)}{0.04461} \ \Delta^2 \left(\frac{BALV}{GDP£/1,000}\right)_{-1}$$

$$+ \underset{(2.4)}{10.065} \ \Delta^2 \ln SPUS - \underset{(3.7)}{12.024} \ \Delta^2 \ln SPUK$$

$$+ \underset{(2.6)}{1.1734} \ \Delta Q1 + \underset{(3.8)}{1.6251} \ Q2 + \underset{(1.9)}{0.95092} \ \Delta Q3 - \underset{(4.2)}{0.86299} \ u_{-1}$$

$$\bar{R}^2 = 0.692 \qquad SE = 1.51 \qquad 1964 \ I - 1973 \ II$$

Foreign currency transactions by UK banks (other than for investment abroad)

Net position

$$\frac{\Delta SWIU}{KM3S} = 0.0028 \ \Delta(RLAE - REUE) - 0.003 \ \Delta RFDS$$

$$SWI = max \ (SWIU, - 0.0065 \ KM3S)$$

Net transactions with UK residents

$$\frac{FCTR}{GDP£} = \underset{(0.3)}{0.00077} + \underset{(2.1)}{0.30715} \left(\frac{BAL - \frac{1}{4} \sum\limits_{i=1}^{4} BAL_{-i}}{GDP£}\right)$$

$$- \underset{(0.8)}{0.00338} \ Q1 + \underset{(0.7)}{0.00291} \ Q2 - \underset{(1.1)}{0.00457} \ Q3 + 0.1195 \ \Delta CONF$$

$$\bar{R}^2 = 0.124 \qquad SE = 0.0085 \qquad DW = 1.93 \qquad 1967 \ II - 1975 \ IV$$

Identified trade credit

Advance and progress payments on imports

$$\frac{APPM}{MG£} = \underset{(3.5)}{0.00595} + \underset{(3.4)}{0.05576} \ \frac{\Delta MG£}{MG£} - \underset{(2.7)}{0.00621} \ Q1 - \underset{(2.0)}{0.00456} \ Q2 - \underset{(2.6)}{0.00585} \ Q3$$

$$\bar{R}^2 = 0.28 \qquad SE = 0.006 \qquad DW = 2.2 \qquad 1963 \ II - 1975 \ IV$$

Other import credit

$$\frac{OIMC}{MG£} = 0.00624 - \underset{(0.8)}{0.00234} \ Q1 + \underset{(0.3)}{0.00104} \ Q2 - \underset{(1.0)}{0.00285} \ Q3 + \underset{(3.2)}{0.50921} \ u_{-1}$$
$$\phantom{\frac{OIMC}{MG£} = }\ \ (1.9)$$

$$\bar{R}^2 = 0.215 \qquad SE = 0.008 \qquad 1967 \ II - 1975 \ IV$$

Export credit extended by UK banks

$$\frac{EXCB}{XG£} = \underset{(10.7)}{-0.03447} + \underset{(0.01)}{0.00006} \ Q1 + \underset{(1.1)}{0.00472} \ Q2 + \underset{(1.2)}{0.00632} \ Q3 - \underset{(1.3)}{0.22331} \ u_{-1}$$

$$\bar{R}^2 = 0.058 \qquad SE = 0.0094 \qquad 1967 \ II - 1975 \ IV$$

Suppliers' export credit

$$\frac{EXSC}{XG\pounds} = -0.02421 + 0.00139 \; \Delta(RLAE - REUE) - 0.01934 \; \frac{DCES}{XG\pounds}$$
$$\phantom{\frac{EXSC}{XG\pounds} = } (5.6) \qquad (1.1) \qquad\qquad\qquad\qquad (2.2)$$

$$+ 0.01378 \; Q1 + 0.01127 \; Q2 + 0.03068 \; Q3$$
$$ (2.5) \qquad\qquad (1.9) \qquad\qquad (5.4)$$

$$\bar{R}^2 = 0.347 \qquad SE \; 0.014 \qquad DW = 1.7 \qquad 1964 \; I - 1978 \; II$$

Advance and progress payments on exports

$$\frac{APPX}{XG\pounds} = 0.00665 + 0.00253 \; Q1 - 0.00021 \; Q2 + 0.00487 \; Q3 + 0.4604 \; u_{-1}$$
$$\phantom{\frac{APPX}{XG\pounds} = } (2.9) \qquad (1.2) \qquad\qquad (0.1) \qquad\qquad (2.2) \qquad\qquad (3.7)$$

$$\bar{R}^2 = 0.208 \qquad SE = 0.0072 \qquad 1964 \; II - 1978 \; II$$

Exchange reserves in sterling (held by central monetary institutions)

$$XRS\pounds = XRSB + XRSG + XRSO$$

Other external banking and money-market liabilities in sterling

$$\frac{OBML}{PM.TWIP} = -19.527 \; \left[\frac{DCES}{GDP\pounds}\right]_{-1} + 0.15267 \; \Delta(RLAE - RFDE - REUE)$$
$$\phantom{\frac{OBML}{PM.TWIP} = } (3.7) \qquad\qquad\qquad\qquad (1.1)$$

$$+ 2.5312 - 0.38481 \; \left[\frac{OBML}{PM.TWIP}\right]_{-1} + 27.705 \; \Delta CONF$$
$$ (4.9) \qquad (2.0)$$

$$\bar{R}^2 = 0.346 \qquad SE = 1.057 \qquad 1972 \; IV - 1978 \; II$$

Unremitted profits in direct private investment overseas

$$\frac{UNRP}{\tfrac{1}{4} \sum\limits_{i=0}^{3} YYUP_{-i}} = -0.00476 \; TIME - 0.22159 \; \frac{TWIP}{\exp(3.5198 + 0.01496 \; TIME)}$$
$$ (5.4) \qquad\qquad (3.5)$$

$$+ 0.43629 \; u_{-1}$$
$$ (3.4)$$

$$\bar{R}^2 = 0.518 \qquad SE = 0.069 \qquad 1965 \; I - 1978 \; I$$

Other commercial short-term transactions

$$\frac{OCSF}{GDP\pounds} = 0.00104 - 0.0165 \; \frac{DCES}{GDP\pounds} + 0.0005 \; \Delta RFDS - 0.0008 \; Q1$$
$$\phantom{\frac{OCSF}{GDP\pounds} = } (1.1) \qquad (2.0) \qquad\qquad (2.2) \qquad\qquad (0.7)$$

$$+ 0.00051 \; Q2 - 0.00068 \; Q3 + 0.034 \; \Delta CONF$$
$$ (0.4) \qquad\qquad (0.6)$$

$$\bar{R}^2 = 0.201 \qquad SE = 0.003 \qquad DW = 1.9 \qquad 1964 \; I - 1976 \; I$$

Total identified capital flows (net)

$$CAP = OIPS + IDI + OICS + MII + \Delta SWI + FCTR + OBML + APPM + OIMC$$
$$+ EXCB + EXSC + APPX + DE\pounds C + OCSF + IOIL + OOIL + UNRP + YSR$$
$$+ XRS\pounds + OCF + LTCG$$

Net acquisition of public sector debt by overseas

Foreign currency: stock $KGD\$ = KGD\$_{-1} - BOF - EGUK + LTCG + KGR\$$

revaluation element $KGR\$ = KGD\$_{-1}\left[\dfrac{E\$EQ_{-1}}{E\$EQ} - 1\right]$

flow $GDO\$ = \Delta KGD\$$

Sterling: flow $GDO\pounds = OIPS + XRSG$

Net deposits of overseas residents

Foreign currency: stock $KDN\$ = KDN\$_{-1} + FCTR + \Delta SWI + LBP\$ + EGUK$

$+ KDR\$$

revaluation element $KDR\$ = KDN\$_{-1}\left[\dfrac{E\$EQ_{-1}}{E\$EQ} - 1\right]$

flow $DNO\$ = \Delta KDN\$$

Sterling: flow $DNO\pounds = OBML + EXCB + DE\pounds C + XRSB$

Balancing item

$$\frac{FITM}{X\pounds + M\pounds} = \underset{(2.3)}{0.00494}\ \Delta(RLAE - REUE - RFDE) - \underset{(3.0)}{0.1364}\ \frac{DCES}{X\pounds + M\pounds}$$

$$- \underset{(3.8)}{1.9704}\ \frac{\Delta(XGNO.PXNM)}{X\pounds + M\pounds} + \underset{(1.9)}{0.66862}\ \frac{\Delta(MGFD.PFDT + MGIM.PMIM)}{X\pounds + M\pounds}$$

$$+ \underset{(2.8)}{0.0977}\ \Delta CONF + 0.01715$$

$$\bar{R}^2 = 0.380 \qquad SE = 0.022 \qquad DW = 2.5 \qquad 1967\ III - 1976\ IV$$

Balance for official financing and official borrowing

Official borrowing (net)

$BOFO = IMF + HMG + ECB$

Balance for official financing:

$BOF\& = (R\$/(2.222/ERUK)) - BOFO$

$BOF = CAP + BALU + FITM - FTKO - EEAL$

CONF iterates to the value that ensures $BOF\& = BOF$ by means of
the algorithm

$CONF = CONF + (BOF\& - BOF)/(8000.PGDP).$

Flow of funds: introduction

134 The preceding sections have covered all income and expenditure
flows leading to the calculation of sectoral financial
surpluses or deficits.   Six sectors are identified, and these
form the columns of the matrix which is designed to show the
financial flows that are the counterpart to the income-expenditure
transactions.   The various types of financial transaction form the
rows of the matrix.

135 It is axiomatic in the flow of funds presentation that the sum of
entries in any row is zero.   Thus, in any row of the matrix one
cell will be uniquely determined once all the others are known: such
a cell is referred to conventionally as a residual.   The same is
true for each column, although, algebraically, once all the row
residuals have been designated, only five of the six columns require
separate column residuals.   The residuals are indicated on the matrix.
Cells are left blank where transactions either do not take place or are
negligible.

136 The following sections describe how the various cells of the
matrix are modelled.   Several of the variables are exogenous.

Flow of funds: personal sector

137 Persons are specified as having a desired long-run ratio of net
liquid assets to permanent non-grant income.   Their desired holdings of
liquid assets in the short run depends on their current savings, on
transitory non-grant income and on how far from their long-run desired
position they are.   The discrepancy between actual net liquid asset
holdings and the short-run desired level affects persons' purchases of
long-dated government debt;   when holdings of liquid assets are above
what is desired, debt purchases will increase, and vice versa.   Long
debt purchases are also influenced by changes in the long-term rate of
interest, the slope of the yield curve and price expectations.

138 Purchases of short debt depend on the size of the financial surplus
and recent movements in short-term interest rates.   Bank lending to
persons moves inversely to both changes in transitory income and
movements in the real cost of such lending.

139 The principal determinants of net receipts of life assurance
and pension funds from persons are employers' contributions to such

Flow of funds matrix								
Item		Public sector	Overseas sector	Personal sector	Industrial and commercial companies	Banking sector	Other financial institutions	Unallocated
Financial surplus/deficit	1	FG	FO	FJ	FFI	FFB	*FFY	RESE
Financial transactions (receipts -, payments +)								
Public sector lending	2	*LGG	LGO	LGJ	LGI		LGV	
Accruals adjustment	3	AAG		AAJ	*AAI	AAB	AAV	
Deposits with:								
Building societies	4			*LZJ	LZI		-LZSD	
NSB/TSB/HP companies, etc.	5	DVG	DVO	DVJ	DVI		*DVV	
Life assurance and pension funds receipts	6	LVG		LVJ			*LVV	
Credit extended by retailers	7	LRCG		*LRCJ	LRCI			
Loans for house purchase by:								
Building societies	8			*LHZJ			LZNA	
Banks	9			*LHBJ		LHBB		
Other	10	LHPG		*LHPJ			LHPV	
Miscellaneous private sector transactions	11			LVOJ	LVOI	LVOB	*LVOV	
Portfolio { capital issues / investment }	12	IPG	IPO	*IPJ	{ CPII / IPI }	{ IPCB / IPB[a] }	{ CPIV / IPV }	
Private sector net investment overseas	13		ILO		*ILI	ILB[b]	ILV	
Overseas column residual	14		¢CROO		*CROI	CROB		
Bank lending:								
n £ to overseas	15		L£BO			*B£OB		
n £ to UK private sector / n ¢ to UK private sector	16 / 17	}		LDJ	LDI	{ *LB£B / LB$B }	LDV	
Banks net currency lending to overseas	18		D$BO			D$BB		
Bank deposits: non-resident £	19		D£BO			*D£BB		
£ domestic / ¢ domestic	20 / 21	} DBG		¢DBJ	¢DBI	{ *BD£B / BD$B }	¢DBV	
Sub-total = sum 2 to 21	22							
Unidentified = 1-22-24	23	RESG	RESO	RESJ	*RESI	RESB	RESV	RESE
Public sector borrowing requirement = 28+33+34	24							
Finance of the PSBR								
Overseas take-up of gilts	25	*BGSG	BGSO					
Reserves, etc.	26	*CFG	CFO					
Other external finance	27	*XOGG	XOGO					
Total external finance = 25+26+27	28							
Domestic non bank:								
Notes and coin	29	NCG		NCJ	*NCI			
Other short debt	30	*BSGG		BSGJ	BSGI		BSGV	
Long debt	31	*BLGG		BLGJ	BLGI		BLGV	
Issue Dept. commercial bills	32	IDCG			*IDCI			
Total domestic non-bank finance = 29+30+31+32	33							
Bank finance of PSBR	34	¢LBG				*LBGB		

[a] Disaggregation: investment in banks, IPBB; in non-banks in sterling, IP£B; in non-banks in foreign currency, IP$B.
[b] Disaggregation: outward direct, ILOB; inward direct, ILIB.
* Row residual.
¢ Column residual.

funds (which are imputed to persons), and proxies for employees'
contributions and for pensions etc. paid out, both these being related
to earnings variables.

140 Other equations in this section are self-explanatory. Persons' bank
deposits are the algebraic residual.

Flow of funds: personal sector

Accruals adjustment

$$AAJ = -0.1 \left[(AVAT + ACAR) - (AVAT_{-1} + ACAR_{-1}) \right] - 0.1 (\Delta YECN + \Delta YJCN)$$

$$- 0.067 \, \Delta \, YECS + TRAT(-0.07 \, Q1 + 0.035 \, Q2 - 0.0525 \, Q3 + 0.0875 \, Q4)$$

Net liquid assets

Long-run desired

$$NLJL = 3.4 \, PC.YDPM$$

Short-run desired

$$NLJS = NLJS_{-1} + \left[0.05 + 0.25 \, \frac{SJ}{NLJL - NLJS_{-1}} \right] (NLJL - NLJS_{-1})$$

$$+ 0.4 \, PC \, \frac{YD - YJG}{PC} - YDPM$$

Actual

$$NLAJ = NLAJ_{-1} + DBJ + LDJ + BSGJ + DVJ + LZSD - LZI - LHBB$$

Public sector long debt

$$BLGJ = \frac{GDP\pounds}{28065} \left[\sum_{i=0}^{7} A_i \, RUKG_{-i} + \sum_{i=0}^{4} B_i \, (RUKG - RLA)_{-i} - \sum_{i=0}^{4} C_i \, PEXP_{-i} \right]$$

$$+ 0.3 \, (NLAJ_{-1} - NLJS_{-1})$$

$$A_{0-7} = 50; \; 50; \; -17; \; -17; \; -17; \; -17; \; -16; \; -16;$$

$$B_{0-4} = 50; \; -20; \; -15; \; -10; \; -5$$

$$C_{0-4} = 100; \; -10; \; -20; \; -30; \; -40$$

Notes and coin

$$NCJ = -0.5 \, NCG$$

Deposits with NSB, TSBs, HP companies, etc.

$$DVJ = 0.1 \, DBJ$$

Public sector, other short debt

$$BSGJ = 0.05 \ (FJ-RESJ) + \frac{GDP\pounds}{28065} \sum_{i=0}^{4} A_i \ RLA_{-i}$$

$$A_{0-4} = -12; \quad 3; \quad 3; \quad 3; \quad 3$$

Net receipts of life assurance and pension funds

$$LVJ = YECO + YVO - TYV + 0.059777 \ YWS - 2.165 \ WSU$$

Miscellaneous transactions

$$LVOJ = 0.2 \ PC \sum_{i=0}^{5} A_i \left[\frac{YD-YJG}{PC} - YPDM \right]_{-i}$$

$$+ \ 0.2 \ \frac{GDP\pounds}{28065} \sum_{i=0}^{8} B_i \ (RLA - 0.95 \ PEXP)_{-i}$$

$$A_{0-5} = 0.1; \quad -0.07; \quad -0.07; \quad -0.07; \quad -0.07; \quad -0.07$$

$$B_{0-8} = 30; \quad 20; \quad 10; \quad 10; \quad -10; \quad -20; \quad -20; \quad -20; \quad 0$$

Bank lending, other than for house purchase

$$LDJ = PC \left[\sum_{i=0}^{5} A_i \left(\frac{YD-YJG}{PC} - YDPM \right)_{-i} \right]$$

$$+ \ \frac{GDP\pounds}{28065} \left[\sum_{i=0}^{8} B_i \ (RLA - 0.95 \ PEXP)_{-i} \right]$$

A_i and B_i as for miscellaneous transactions

Stock of bank advances

$$KBMS = KBMS_{-1} - LDJ + LHBB - LMCJ$$

Domestic bank deposits

$$DBJ = FJ - LGJ - AAJ + LZI - LZSD - DVJ - LVJ + LRCG + LRCI + LZNA$$
$$+ \ LHBB + LHPG + LHPV - LVOJ + CPII + IPCB + CPIV + IPV + IPBB$$
$$+ \ IP\$B + IP\pounds B + IPI + IPO + IPG - LDJ - RESJ - NCJ - BSGJ - BLGJ$$

Flow of funds: industrial and commercial companies

141 The equations for bank lending to these companies and purchases of
government debt by them are of the same structure as for persons, except
that actual and desired liquid assets are not modelled and do not
therefore enter the equation for debt purchase. As in the case of
persons, companies' bank deposits are the algebraic residual.

Flow of funds: industrial and commercial companies

Public sector, long debt

$$BLGI = 0.01\ DBI + \frac{GDP\pounds}{28065} \left[\sum_{i=0}^{7} A_i\ RUKG_{-i} + \sum_{i=0}^{4} B_i\ (RUKG - RLA)_{-i} \right.$$

$$\left. - \sum_{i=0}^{4} C_i\ PEXP_{-i} \right]$$

$A_{0-7} = 5;\quad 5;\quad -2;\quad -2;\quad -2;\quad -2;\quad -1;\quad -1$

$B_{0-4} = 5;\quad -2;\quad -1;\quad -1;\quad -1$

$C_{0-4} = 10;\quad -1;\quad -2;\quad -3;\quad -4$

Public sector, other short debt

$$BSGI = 0.05\ DBI + \frac{GDP\pounds}{28065} \left[\sum_{i=0}^{2} A_i\ (RLB-RCD)_{-i} \right]$$

$A_{0-2} = 100;\quad -50;\quad -50$

Miscellaneous transactions

$$LVOI = 0.1\ PIMO\ (\sum_{i=0}^{5} A_i\ \Delta PROM_{-i}) - IIC\pounds + \frac{GDP\pounds}{28065} \left[\sum_{i=0}^{7} B_i\ (RLA-PEXP)_{-i} \right]$$

$A_{0-5} = -30;\quad 0;\quad 14:\quad 18;\quad 15;\quad 10$

$B_{0-7} = 50;\quad 20;\quad 10;\quad -10;\quad -10;\quad -20;\quad -20;\quad -20$

Bank lending

$$LDI = PIMO\ (\sum_{i=0}^{5} A_i\ \Delta PROM_{-i}) - IIC\pounds + \frac{GDP\pounds}{28065} \left[\sum_{i=0}^{7} B_i\ (RLA-PEXP)_{-i} \right]$$

A_i and B_i as for miscellaneous transactions

Domestic bank deposits

DBI = FFI - LGI + AAB + AAV + AAJ + AAG - LZI - DVI - LRCI - LVOI - CPII

   - IPI + ILO + ILOB + ILIB + ILV + CROO + CROB - LDI + NCJ + NCG

   - BSGI - BLGI + IDCG + RESG + RESO + RESJ + RESB + RESV + RESE

Flow of funds: financial institutions (other than banks)

142 Bank lending, debt purchases and bank deposits are specified in a similar way for these institutions as for industrial and commercial companies. Amongst these institutions, some flows to and from life assurance and pension funds and building societies are modelled separately. Net receipts of the former come predominantly from the personal sector, and their treatment is listed above under that heading.

143 Building societies' receipts of interest depend on the mortgage rate and the value of outstanding mortgages. Receipts of repayments of principal are modelled in a manner which aims to take account of both regular and premature repayments. The former are related to the size of outstanding mortgages, their age (as proxied by a term roughly measuring the proportion taken out in the past two years), because capital is repaid less heavily at the beginning than at the end of the mortgage life, and the mortgage rate, because when rates rise there is some tendency to reschedule capital repayments. The latter (premature repayments) are assumed to be generated largely by trading-up by existing owner-occupiers, and are therefore linked to net advances.

144 Net inflows into building society shares and deposits are related to interest paid on such accounts, a measure of persons' investable funds, and the rate of interest offered and its relation to other short and long rates. General allowance is made for the scaling effect of inflation.

145 Net advances on mortgages by building societies are specified in real terms. When no guideline is in operation, advances are determined by a weighted average of the funds available and the demand for mortgages, with the former carrying almost the entire weight. The supply of funds is dependent on inflows of shares and deposits, but a trend is incorporated implying that societies on-lend a declining proportion of their receipts - a feature of recent years during which liquidity ratios have risen. The demand for mortgages is assumed to be a function of some measure of income and of house prices. When the guideline operates, the above process gives way to some extent, and a 40% weight in the determination of advances is accorded to the limit on net advances implied by the guideline (which applies, in fact, to new commitments net of peripheral lending).

Flow of funds: financial institutions (other than banks)

Public sector long debt

$$BLGV = 0.2 \, (FJ - RESJ) - \frac{GDP\pounds}{28065} \left[\sum_{i=0}^{7} A_i \, RUKG_{-i} + \sum_{i=0}^{4} B_i \, (RUKG-RLA)_{-i} \right]$$

$$- \sum_{i=0}^{4} C_i \, PEXP_{-i}$$

A_{0-7} = -100; -100; 33; 33; 33; 33; 34; 34

B_{0-4} = -100; 40; 30; 20; 10

C_{0-4} = -200; 20; 40; 60; 80

Public sector 'other' short debt

$$BSGV = \frac{GDP\pounds}{28065} \left(\sum_{i=0}^{2} A_i \, RLA_{-i} - \sum_{i=0}^{3} B_i \, RUKG_{-i} \right) + 0.05 \, (FJ-RESJ)$$

$$+ 0.1(FFI + RESG + RESO + RESJ + RESB + RESV + RESE)$$

A_{0-2} = 30; -10; -20

B_{0-3} = 90; -20; -20; -50

Bank lending

$$LDV = \frac{GDP\pounds}{28065} \left[\sum_{i=0}^{7} A_i \, RUKG_{-i} + \sum_{i=0}^{7} B_i \, (RLA - 0.95 \, PEXP)_{-i} \right]$$

A_{0-7} = -10; -5; 2; 2; 2; 2; 2; 5

B_{0-7} = 10; 5; -2; -2; -2; -2; -2; -5

Bank deposits

$$DBV = -FG - FO - FJ - FFI - FFB - RESE - LGV - AAV + LZSD + LVG + LVJ$$

$$- LZNA - LHPV + LVOJ + LVOI + LVOB - CPIV - IPV - ILV - LDV - RESV$$

$$- BSGV - BLGV + DVJ + DVG + DVO + DVI$$

Building societies

Receipts of interest

$$LZMI = RZMG \, (KZNA + KZNA_{-1})/800$$

Receipts of repayments of principal

$$\frac{LZRP}{KZNA_{-1}} = \underset{(12.7)}{0.02773} - \underset{(4.0)}{0.01802} \, \frac{\sum_{i=1}^{8} (LZRP + LZNA)_{-i}}{KZNA_{-1}}$$

$$- \underset{(0.3)}{0.00004} \, RZMG + \underset{(14.2)}{0.26701} \, \frac{LZNA}{KZNA_{-1}}$$

$\overline{R}^2 = 0.82$ SE = 0.0011   1966 I-1977 II

Net increase in shares and deposits

$$LZSD = ICA + NIFL$$

where interest credited to accounts is given by:

$$ICA = -10.75 + 0.71 \quad LZRN$$
$$\quad\quad (15.7) \quad (249.1)$$

$$\bar{R}^2 = 0.99 \qquad SE = 2.6 \qquad 1966I-1977II$$

and net inflows are given by:

$$*NIFL = 1562.3 + 0.146 \left[\frac{YD*-ICA}{PC}\right] + 25.068 \ (RZSG-RUKG)$$
$$\quad\quad\quad (7.2) \quad\quad (6.8) \qquad\qquad\qquad (3.1)$$

$$\quad\quad +118.0 \ (RZSG-RLS) + 20.54 \ RZSG$$
$$\quad\quad\quad (17.4) \qquad\qquad\quad (2.0)$$

$$\bar{R}^2 = 0.91 \qquad SE = 40.2 \qquad DW = 1.45 \qquad 1966I-1977II$$

with YD* being an adjusted measure of disposable income:

$$YD* = YD - 0.6 \ YJG - 0.3 \ YJG_{-1} - 0.1 \ YJG_{-2} - LVJ - YSAJ - ORNT + EIP$$

Stock of shares and deposits

$$KZSD = LZSD + KZSD_{-1}$$

Guideline in terms of new commitments

$$LZGL = LZGL_{-1} \ (WSU/WSU_{-1})$$

Real net mortgage advances

$$LZRA = (1 - 0.41197 \ DBGL) \left[(0.97)(0.9) \ \frac{(0.25 \sum_{i=0}^{3} LZSD_{-i})(0.9446-0.00107TIME)}{PNH} \right.$$

$$+ (1-0.97) \left\{ (200.60 + 141.69 \ YD*)/1000 \ PNH \right.$$
$$\quad\quad\quad\quad (0.1) \quad\quad (0.7)$$

$$\left. + 100 \ (300.61 \frac{PNH/PC + (PNH/PC)_{-2}}{(PNH/PC)_{-2}}) \right\} \right]$$
$$\quad\quad\quad (4.9)$$

$$+ 0.41197 \ DBGL \ \frac{0.5(LZGL + LZGL_{-1}) - LZRP}{PNH}$$
$$\quad\quad (4.8)$$

$$\bar{R}^2 = 0.882 \qquad SE = 166.2 \qquad 1964IV-1978I$$

with YD* defined as above

Net mortgage advances (nominal)

$$LZNA = LZRA.PNH$$

Stock of mortgage advances outstanding

$$KZNA = LZNA + KZNA_{-1}$$

Persons receipts of interest on shares and deposits

$$LZSI = RZSN \ (KZSD + KZSD_{-1})/800$$

Proxy for liquidity position

$$ZLIQ = (1 - KZNA/KZSD).100$$

Flow of funds: public sector

146 The principal items in the public sector flow of funds are modelled under the other sector headings and reach the public sector column as residuals.   Thus, for instance, debt sales are modelled as purchases by the other sectors, and reserves and external finance are the obverse of overseas sector flows.   There is one estimated equation, which relates total holdings of notes and coin to consumer spending and interest rates.

Flow of funds: public sector

Accruals adjustment

$$AAG = (AVAT + ACAR) - (AVAT_{-1} + ACAR_{-1}) + 0.5 \ (\Delta YECN + \Delta YJCN)$$

$$+ \ 0.33 \ \Delta YECS + ANSR - 0.5 \ (ANSR_{-1} + ANSR_{-2})$$

$$+ \ TRAT \ (0.2 \ Q1 - 0.1 \ Q2 + 0.15 \ Q3 - 0.25 \ Q4)$$

Borrowing requirement

$$PSBR = -FG + AAG + DVG + LVG + LRCG + LHPG + IPG + DBG + RESG$$

$$- \ LGO - LGI - LGJ - LGV$$

Notes and coin

Stock

$$\ln KNCS = \underset{(3.2)}{0.46084} + \underset{(5.1)}{0.51509} \ \ln CND\pounds - \underset{(1.7)}{0.32728} \ \ln \left(1 + \frac{RUKG}{100}\right)$$

$$+ \ \underset{(3.1)}{0.38326} \ \ln KNCS_{-1}$$

$$\bar{R}^2 = 0.998 \qquad SE = 0.016 \qquad 1963 \ II - 1978 \ II$$

Flow

$$NCG = -\Delta KNCS$$

Bank finance of PSBR

$$LBG = FG - AAG - DVG - LVG - LRCG - LHPG - IPG - DBG - RESG$$

$$+ \ BGSO + CFO + XOGO - NCG + BSGJ + BSGI + BSGV - IDCG + BLGV$$

$$+ \ BLGI + BLGJ + LGO + LGV + LGI + LGJ$$

Net lending to private and overseas sectors

$$KLNG = KLNG_{-1} - LGO - LGJ - LGI - LGV + IPG + LHPG$$

Flow of funds: overseas sector

147 The modelling of capital flows in the balance of payments has already been described. These flows are amalgamated and apportioned to flow of funds categories by technical equations, according to known definitions or by rules of thumb. Any seasonality that may carry through from the capital account (which is itself unadjusted) can be removed through the residuals.

Flow of funds: overseas sector

Deposits with hire-purchase companies

$$DVO = 0.1 \ OBML$$

Portfolio investment

$$IPO = OICS$$

Private sector net investment

$$ILO = IDI + IOIL + MII + 0.955 \ UNRP + YSR + OOIL + OCF - LBP\$$$
$$+ EXSC + APPM + APPX + OIMC + OCSF$$

Residual

$$CROO = FO - LGO - DVO - IPO - ILO - L\pounds BO - D\$BO - D\pounds BO - RESO$$
$$- BGSO - CFO - XOGO$$

Bank lending in sterling

$$L\pounds BO = LTCG + EXCB + DE\pounds C + 0.08 \ XRSG + 0.045 \ UNRP - LGO$$

Bank lending in foreign currency

$$D\$BO = \Delta SWI + FCTR + EGUK + LBP\$ + 0.8 \ HMG$$

Sterling deposits with UK banks

$$D\pounds BO = XRSB + 0.9 \ OBML$$

Unidentified

$$RESO = FITM - EEAL$$

Gilt-edged stocks

$$BGSO = 0.35 \ XRSG + 0.6 \ OIPS + XRSO$$

Reserves, etc

$$CFO = - BOF - ECB - EGUK - 0.8 \ HMG$$

Other external finance

$$XOGO = ECB + 0.4 \ OIPS + 0.57 \ XRSG$$

Flow of funds: banks

148   The banks are represented as playing an entirely passive role.
Their lending is modelled as the sum of the other sectors' borrowing,
which is in effect demand-determined.   Thus, any effects of credit
restraint policies have to be introduced through residuals.   Deposits
are the sum of other sectors' deposits which are mainly, as has been
explained, residuals in each sector's behaviour.

149   One behavioural equation is necessary in order to separate lending
in sterling to the private sector from lending in foreign currency: the
latter is related to the expected change in the exchange rate and
comparative interest rates.

Flow of funds: banks

Portfolio investment

$$IPB = IPBB + IP\$B + IP£B$$

Private sector net investment overseas

$$ILB = ILIB + ILOB$$

Bank lending to private sector

Total

$$LDB = -LDJ - LDI - LDV$$

Sterling

$$LB£B = LDB - LB\$B$$

Foreign currency

$$LB\$B = \frac{GDP£}{28065} \left(\sum_{i=0}^{3} A_i \left\{ \left[\frac{1 + DE\$E_{-1}}{100} \right]^{-1} \left[1.03 + \frac{REU\$}{100} \right] - \left[1 + \frac{RCD}{100} \right] \right\} - i \right.$$

$$A_{0-3} = 2500; \ 2500; \ -2500; \ -2500$$

Domestic bank deposits

Total

$$DBB = -DBG - DBI - DBJ - DBV$$

Sterling

$$BD£B = DBB - BD\$B$$

Foreign currency

$$BD\$B = -LB\$B + FCTR + LBP\$$$

Unidentified

$$RESB = RESS + FFB - AAB - IPBB - IPCB - ILIB - LVOB$$

Foreign currency deposits of UK residents

$$DUKC = KM3S - KM\pounds S$$

Monetary aggregates

150 DCE and money flows follow by identity from summation of appropriate financial flows.

<div align="center">

Monetary aggregates

</div>

Domestic credit expansion

$$DCES = IP\pounds B - L\pounds BO + LHBB + LB\pounds B - LBG + BGSO + CFO + XOGO - NCG$$

Money supply

Sterling M3, flow

$$M3\pounds = -NCG - BD\pounds B$$

Sterling M3, stock

$$KM\pounds S = KM\pounds S_{-1} + M3\pounds$$

Total M3, stock

$$KM3S = KM3S_{-1} + M3\pounds - BD\$B + DUKC_{-1} \ (ERUK/ERUK_{-1} - 1)$$

World output and trade

151 World activity is exogenous. An equation relates import volume of the OECD area, UK-weighted, to OECD industrial production, and another combines this with imports of non-OECD countries, which is exogenous, to yield a series for world import volume, UK-weighted. This, in turn, feeds into an equation for the volume of world exports of manufactures, UK-weighted.

World output and trade

OECD industrial production

Trade-weighted

TWIP = RTWP . WIP

Deviation from trend

$$DWIP = 100 \left[\frac{WIP}{\exp(3.93637 + 0.01255 \, (TIME - 20))} - 1 \right]$$

Import volume, UK-weighted

OECD

$$\ln WTM1 = - \underset{(29.1)}{2.18143} + \underset{(94.2)}{1.50524} \ln TWIP - \underset{(2.5)}{0.14401} \, (1 + DWIP/100)$$

$$+ \underset{(5.1)}{0.51563} \, u_{-1}$$

$$\bar{R}^2 = 0.998 \qquad SE = 0.0172 \qquad 1960 \, II - 1978 \, II$$

World

$$WTM = \sum_{i=J}^{J+3} WTM_{-i} \left[\frac{WWT1_{-4} \; WTM1}{\underset{i=j}{\overset{j+3}{\Sigma}} \, WTM1_{-i}} + \frac{(1-WWT1_{-4}) \, WTM2}{\underset{i=j}{\overset{j+3}{\Sigma}} \, WTM2_{-i}} \right]$$

where J = Q1 + 2Q2 + 3Q3 + 4Q4

World export volume, manufacturers, UK-weighted

$$\ln WTX = - \underset{(16.1)}{0.84299} + \underset{(95.7)}{1.17693} \ln WTM + \underset{(6.0)}{0.5827} \, u_{-1}$$

$$\bar{R}^2 = 0.999 \qquad SE = 0.021 \qquad 1960 \, II - 1978 \, II$$

3

Listing of variables

Pages   94 - 119

Listing of variables

Code	Description	Units	Type	No.
BSGV	Other short debt: OFIs	£mn	B	86
BTAB	Net private and government transfers abroad	£mn	I	74
BV	Book value of stocks	£mn	I	21
BYPA	Interest, profits and dividends (net)	£mn	I	74
C	Total consumers' expenditure	75 £mn	I	14
C£	Total consumers' expenditure	£mn	I	15
CAP	Investment and other capital flows	£mn	I	78
CB	Consumers' expenditure on beer	75 £mn	B	14
CD	Consumers' expenditure on durable goods	75 £mn	B	14
CD£	Consumers' expenditure on durable goods	£mn	I	15
CEDB	Rate of customs and excise duties on beer	£	T	69
CEDS	Rate of customs and excise duties on spirits	£	T	70
CEDT	Rate of customs and excise duties on tobacco	£	T	70
CEDW	Lower basic rate of customs and excise duty per gallon of wine	£	T	69
CFO	Reserves etc.: overseas	£mn	B	89
CIE	Constructed intercept on contracted-out employers' graduated contributions function	£/wk	T	61
CIJ	Constructed intercept on contracted-out employees' graduated contributions function	£/wk	T	61
CMV	Consumers' expenditure on cars and motor cycles	75 £mn	X	
CND	Consumers' expenditure on non-durable items	75 £mn	B	14
CND£	Consumers' expenditure on non-durable items	£mn	I	15
COMP	Index of price competitiveness of manufactures	1975=1	I	52
CONF	Proxy for external confidence		I	79
CPII	Capital issues (UK): ICCs	£mn	X	
CPIV	Capital issues (UK): OFIs	£mn	X	

[a] Unless otherwise stated, seasonally-adjusted series are used in all cases where the appropriate statistics are available or can be derived.

[b] B = behavioural equation; I = identity; T = technical equation; X = exogenous (including dummies).

Listing of variables (continued)

Code	Definition	Data unit[a]	Defined by[b]	Page
CRE	Constructed slope on contracted-out employers' contributions function	Per cent	X	
CRJ	Constructed slope on contracted-out employees' contributions function	Per cent	X	
CROB	Overseas residual: banks	£mn	X	89
CROO	Overseas residual: overseas	£mn	I	14
CT	Consumers' expenditure on tobacco	75 £mn	B	14
CWS	Consumers' expenditure on wines and spirits	75 £mn	B	90
DBB	Domestic bank deposits (sterling and foreign currency): banks	£mn	I	
DBG	Domestic bank deposits (sterling and foreign currency): public	£mn	X	
DBGL	Dummy for building society guideline		X	
DBI	Domestic bank deposits (sterling and foreign currency): ICCs	£mn	I	84
DBJ	Domestic bank deposits (sterling and foreign currency): persons	£mn	I	83
DBV	Domestic bank deposits (sterling and foreign currency): OFIs	£mn	I	86
DCES	Sterling domestic credit expansion	£mn	I	91
DEPJ	Proxy for personal sector depreciation	£mn	I	59
DE$E	Expected change in the $/£ exchange rate	Per cent	B	41
DE£C	Change in external sterling claims	£mn	X	
DLON	Dummy for government loan to building societies in 1974		X	
DNAT	Dummy to represent planned rundown of manpower in nationalised industries in late 1960s		X	
DNO$	Net foreign currency deposits of overseas residents	£mn	I	79
DNO£	Net sterling deposits of overseas residents	£mn	I	79
DPES	Percentage of employees settling in current quarter	Per cent	X	
DPPM	Inland consumption of petroleum products: motor spirit	000 tonnes	B	28
DPPO	Inland consumption of petroleum products: other	000 tonnes	B	28
DPRG	Dummy for the effect of price restraint by the trading public sector		X	
DRE1	Dummy for regime of earned income relief (up to 1970/71)		X	
DRE2	Dummy for regime of earned income relief (from 1971/72 to 1972/73)		X	
DRLS	Difference between rate on long-term government stock and 3-month LA rate	Per cent	I	53
DRWI	Forecast assumptions for real wage increase	Per cent	X	
DSET	Weekly adult male SET contributions	£ w/k week	X	

Code	Description	Unit	Type	No.
DTAX	Dummy variable effective when non-mortgage interest payments are deductible for tax purposes	£	X	
DTNO	Rate of customs and excise duty on 1,000 cigarettes		T	70
DUKC	Foreign currency deposits of UK residents	£mn	I	91
DVG	Deposits with NSB/TSB/HP companies: public	£mn	X	
DVI	Deposits with NSB/TSB/HP companies: ICCs	£mn	X	
DVJ	Deposits with NSB/TSB/HP companies: persons	£mn	B	82
DVO	Deposits with NSB/TSB/HP companies: overseas	£mn	B	89
DWIP	Deviation of OECD industrial production from trend	Per cent	T	92
D£BO	Non-resident bank deposits (sterling): overseas	£mn	T	89
D$BO	Banks net currency lending to overseas: overseas	£mn	B	89
EC	Total corporate current expenditure	£mn	I	65
ECAB	Corporate profits due abroad	£mn	I	65
ECB	Public sector borrowing under exchange cover scheme	£mn	X	
ECCH	Corporate current transfers to charities	£mn	X	
ECDV	Payments of dividends on ordinary shares	£mn	X	
ECM	Employment costs per employee, whole economy	£mn per 1,000	I	38
ECMM	Employment costs per employee, manufacturing	£mn	I	38
ECOI	Payments of dividends on other shares	£mn	I	65
ECPT	Corporate payments of profits tax	£mn	X	
ECTA	Net company sector transfers abroad	£mn	X	
ECT1	Proxy for corporate payments of income tax	£mn	I	64
ECT2	Proxy for corporate payments of mainstream corporation tax	£mn	I	65
ECT3	Combination of ECT1 and ECT2	£mn	I	65
EDBT	Public sector debt interest payments	£mn	B	67
EEAL	EEA loss on forward commitments	£mn	X	
EER	Effective UK exchange rate index	£/foreign ¢	I	41
EE$	Equilibrium $/£ exchange rate	$/£	B	40
EF	Total final expenditure	75 £mn	I	30
EFUS	US final expenditure	US$ bn	X	
EF£	Total final expenditure	£mn	I	31
EGC	Public sector current expenditure	£mn	I	67

[a] Unless otherwise stated, seasonally-adjusted series are used in all cases where the appropriate statistics are available or can be derived.

[b] B = behavioural equation; I = identity; T = technical equation; X = exogenous (including dummies).

Listing of variables (continued)

Code	Definition	Data unit[a]	Defined by[b]	Page
EGTA	Net public sector transfers abroad	£mn	X	
EGUK	Public sector borrowing abroad through UK banks (under exchange cover scheme)	£mn	X	
EIP	Households' gross interest payments	£mn	B	57
EJTA	Personal sector net transfers abroad	£mn	X	
ENIH	National insurance payments	£mn	I	62
ERG	Green pound exchange rate index (units of account per £)	1975=1	X	
ERUK	UK exchange rate against US$	1975=1	I	41
ESAB	Subsidies	£mn	X	
EXCB	Export credit extended by UK banks	£mn	B	77
EXSC	Suppliers' export credit	£mn	B	78
EYB£	Payments on UK banks' external sterling liabilities	£mn	T	73
EYB$	Payments on UK banks' net liabilities in foreign currencies	£mn	X	
EYCB	Payments on exchange cover borrowing	£mn	T	74
EYGL	Payments on inter-government loans to UK	£mn	T	73
EYHM	Payments on the HMG loan	£mn	X	
EYIM	Interest payments to IMF	£mn	T	74
EYMC	Payments on import credit	£mn	T	73
EYMI	Payments on private miscellaneous investment	£mn	T	73
EYM£	Payments on sterling import credit	£mn	T	73
EYM$	Payments on foreign currency import credit	£mn	T	73
EYOL	Payments on private oil investment	£mn	X	
EYOT	Interest, profits and dividends other than on private investment: debits	£mn	I	
EYPA	Interest, profits and dividends: total debits	£mn	I	74
EYSR	Payments on private total portfolio investment	£mn	T	74
EYS£	Payments on private sterling portfolio investment	£mn	T	73
EYS$	Payments on private foreign currency portfolio investment	£mn	T	73
EYUP	Payments on private direct investment	£mn	X	73
EYXR	Payments on overseas public portfolio investment	£mn	T	73
E$EQ	$/£ exchange rate (end-quarter)	$/£	B	41

Code	Description	Units	Type	
ESQA	Difference between the quarterly average $/£ exchange rate and the average of the beginning and end-quarter rates	$	X	
FC	Net acquisition of financial assets: companies	£mn	I	66
FCA	Factor cost adjustment	75 £mn	B	30
FCA£	Factor cost adjustment	£mn	I	30
FCTR	Banks' foreign currency transactions with UK residents	£mn	B	77
FFB	Net acquisition of financial assets: banks	£mn	X	
FFI	Net acquisition of financial assets: ICCs	£mn	T	66
FG	Net acquisition of financial assets: public sector	£mn	I	67
FITM	Balancing item	£mn	B	79
FJ	Net acquisition of financial assets: persons	£mn	I	63
FLTE	Flat rate national insurance contributions paid by employers	£mn	I	62
FLTJ	Flat rate national insurance contributions paid by employees and self-employed	£mn	I	62
FO	Net acquisition of financial assets: overseas	£mn	I	75
FTE	Number in full-time education (age 15 and over)	000's	X	
FTKC	Net capital transfers: companies	£mn	I	65
FTKG	Net capital transfers: public	£mn	X	
FTKJ	Net capital transfers: persons	£mn	X	
FTKO	Net capital transfers: overseas	£mn	X	
G	Public authorities' current expenditure on goods and services	75 £mn	X	
G£	Public authorities' current expenditure on goods and services	£mn	I	67
GDO£	Change in public sector's net external liabilities in sterling	£mn	I	79
GDO$	Change in public sector's net external liabilities in foreign currencies	£mn	I	79
GDP	Gross domestic product (average estimate)	75 £mn	I	30
GDPE	Gross domestic product (expenditure estimate)	£mn	I	31
GDPE.	Gross domestic product (expenditure estimate)	75 £mn	I	30
GDPO	Gross domestic product (output estimate)	75 £mn	I	30
GDPY	Gross domestic product (income estimate)	75 £mn	I	30

[a] Unless otherwise stated, seasonally-adjusted series are used in all cases where the appropriate statistics are available or can be derived.

[b] B = behavioural equation; I = identity; T = technical equation; X = exogenous (including dummies).

Listing of variables (continued)

Code	Definition	Data unit[a]	Defined by[b]	Page
GIE	Constructed intercept on contracted-in employers' graduated contributions function	£/wk	T	61
GIJ	Constructed intercept on contracted-in employees' graduated contributions function	£/wk	T	61
GISJ	Constructed intercept on self-employed graduated contributions function	£/wk	T	61
GRDE	Employers' graduated contributions	£mn	I	62
GRDJ	Employees' and self-employed graduated contributions	£mn	I	62
GRE	Constructed slope on contracted-in employers' graduated contributions function	Per cent	X	
GRES	Rate of national insurance surcharge	Per cent	X	
GRJ	Constructed slope on contracted-in employees' graduated contributions function	Per cent	X	
GRS	Constructed slope on self-employed graduated contributions function	Per cent	X	
GSR	Gross settlement rate	Per cent	T	37
GSRO	GSR before taking account of the effect of changes in personal direct taxes and national insurance contributions	Per cent	I	37
GTPF	Gross trading profits of financial companies	£mn	B	66
G3AE	Aggregate income above which employers' contributions do not increase	£/wk	T	61
G3AL	Aggregate income above which employees' contributions do not increase	£/wk	T	61
G3E	Employers' graduated contributions divided by the ratio of the income at which maximum contributions first apply to the actual average income		I	61
G3J	Employees' graduated contributions divided by the ratio of the income at which maximum contributions first apply to the actual average income		I	
G3S	self-employment income above which no extra contributions are payable	£/wk	I	61
HMF	Actual hours worked in manufacturing industry	hrs/wk	T	61
HMG	Change in outstanding HMG loans	£mn	B	37
HN	Normal hours worked in manufacturing industry	hrs/wk	X	
HOT	Actual hours worked in other industries	hrs/wk	B	

Code	Description	Unit	Type	Page
IB	Investment in industrial buildings	75 £mn	B	17
IDCG	Issue Department take-up of commercial bills: public	£mn	X	
IDI	Inward direct investment – UK private sector	£mn	X	
IF	Gross fixed investment	75 £mn	I	18
IF£	Gross fixed investment	£mn	I	18
IFC£	Company sector fixed investment	£mn	I	18
IFG	Public sector fixed investment	75 £mn	I	18
IFG£	Public sector fixed investment	£mn	I	18
IFJ£	Personal sector fixed investment	£mn	B	18
IFP	Total private sector fixed investment	75 £mn	I	18
IFP£	Total private sector fixed investment	£mn	I	18
IHG	Public sector residential fixed investment	75 £mn	X	18
IHP	Private sector residential fixed investment	75 £mn	B	17
IHP£	Private sector residential fixed investment	£mn	I	18
II	Total stockbuilding	75 £mn	I	21
II£	Total stockbuilding	£mn	I	22
IIB	Stockbuilding: basic materials, fuels and work in progress	75 £mn	B	20
IIC£	Company sector stockbuilding	£mn	B	22
IIF	Stockbuilding: finished goods	75 £mn	B	20
IIFM	Stockbuilding: finished goods held by manufacturers	75 £mn	I	21
IIG£	Public sector stockbuilding	£mn	I	22
IIJ£	Personal sector stockbuilding	£mn	B	22
IIM	Manufacturing stockbuilding	75 £mn	I	21
IIO	'Other' stockbuilding	75 £mn	I	20
IIR	Retail stockbuilding	75 £mn	I	21
IIW	Wholesale stockbuilding	75 £mn	I	21
ILB	Private sector net investment overseas: banks	£mn	I	
ILIB	Private sector net investment overseas (inward direct): banks	£mn	X	90

[a] Unless otherwise stated, seasonally-adjusted series are used in all cases where the appropriate statistics are available or can be derived.

[b] B = behavioural equation; I = identity; T = technical equation; X = exogenous (including dummies).

Listing of variables (continued)

Code	Definition	Data unit[a]	Defined by[b]	Page
ILO	Private sector net investment overseas: overseas	£mn	I	89
ILOB	Private sector net investment overseas (outward direct) : banks	£mn	X	
ILUK	Flow of inter-government loans by UK	£mn	X	
ILV	Private sector net investment overseas: OFIs	£mn	X	
IMF	Net change in account with IMF	£mn	X	
IMPD	Stock of import deposits	£mn	X	
ING	Public sector non-residential fixed investment	75 £mn	X	
INP	Private sector non-residential fixed investment	75 £mn	I	18
INP£	Private sector non-residential fixed investment	£mn	I	18
INS	Fixed investment in shipping	75 £mn	X	
IOIL	Inward oil investment	£mn	X	
IPB	Portfolio investment: banks	£mn	I	90
IPBB	Portfolio investment (shares in banks): banks	£mn	X	
IPCB	Capital issues (UK): banks	£mn	X	
IPG	Portfolio investment: public	£mn	X	
IPI	Portfolio investment: ICCs	£mn	X	
IPMD	Fixed investment in plant and machinery: distribution and services	75 £mn	B	16
IPMM	Fixed investment in plant and machinery: manufacturing	75 £mn	B	16
IPO	Portfolio investment: overseas	£mn	I	89
IPV	Portfolio investment: OFIs	£mn	X	
IP£B	Portfolio investment (non-bank £ shares): banks	£mn	X	
IP$B	Portfolio investment (non-bank F/$ shares): banks	£mn	X	
IRES	Other private sector fixed investment including the North Sea	75 £mn	X	
IVEH	Fixed investment in vehicles	75 £mn	B	17
KBMS	Stock of bank advances to persons	£mn	B	83

KDN$	Value of the stock of the banking sector's net external liabilities in foreign currencies		£mn	I	79
KDR$	Revaluation adjustment component of KDN$		£mn	T	79
KEB£	Stock of UK banks' external sterling liabilities		£mn	T	73
KEB$	Stock of UK banks' net liabilities in foreign currencies		£mn	T	73
KECB	Stock of exchange cover borrowing outstanding		£mn	T	74
KEGL	Stock of inter-government loans to UK		£mn	T	73
KEHM	HMG loan outstanding		£mn	T	74
KEIM	Net liabilities to IMF		£mn	T	74
KEMC	Stock of import credit		£mn	T	73
KEMI	Stock of inward private miscellaneous investment		£mn	T	73
KEM£	Stock of sterling import credit		£mn	T	73
KEM$	Stock of foreign currency import credit		£mn	T	73
KEOL	Stock of inward private oil investment		£mn	T	73
KEOT	Stock of UK external liabilities other than private direct investment but including miscellaneous		£mn	I	74
KESR	Stock of inward private portfolio investment		£mn	T	73
KES£	Stock of inward private sterling portfolio investment		£mn	T	73
KES$	Stock of inward private foreign currency portfolio investment		£mn	T	73
KET	Stock of UK external liabilities		£mn	I	74
KEUP	Stock of inward private direct investment		£mn	T	73
KEXR	Stock of overseas public portfolio investment		£mn	T	73
KGD$	Stock of the public sector's net external liabilities in foreign currency		£mn	I	79
KGR$	Revaluation adjustment component of KGD$		£mn	T	79
KIFM	Stock level: finished goods held by manufacturers	75	£mn	I	21
KIIB	Stock level: basic materials, fuels and work in progress	75	£mn	I	20
KIIF	Stock level: finished goods	75	£mn	I	19
KIIM	Stock level: manufacturing industry	75	£mn	I	21

[a] Unless otherwise stated, seasonally-adjusted series are used in all cases where the appropriate statistics are available or can be derived.

[b] B = behavioural equation; I = identity; T = technical equation; X = exogenous (including dummies).

Listing of variables (continued)

Code	Definition	Data unit[a]	Defined by[b]	Page
KIIO	Stock level: other	75 £mn	B	20
KIIR	Stock level: retail	75 £mn	B	21
KIIT	Stock level: total	75 £mn	I	21
KIIW	Stock level: wholesale	75 £mn	B	21
KLNG	Stock of net public sector lending to private and overseas sectors	£mn	B	88
KMV	Stock of consumers' expenditure on cars and motor cycles	75 £mn	B	15
KM3S	Stock of money (M3)	£mn	I	91
KM£S	Stock of sterling M3	£mn	I	91
KNCS	Stock of notes and coin in circulation	£mn	B	88
KPMD	Stock of IPMD	75 £mn	T	16
KPMM	Stock of IPMM	75 £mn	T	16
KR$	Stock of gold and foreign exchange reserves	US$ mn	B	41
KR$M	Equilibrium stock of reserves	US$ mn	B	40
KYGG	Stock of gold	£mn	T	72
KYGL	Stock of inter-government loans by UK	£mn	T	72
KYOL	Stock of outward private oil investment	£mn	T	72
KYOT	Stock of UK external assets other than private investment	£mn	I	72
KYRO	Stock of other reserves	£mn	T	72
KYSR	Stock of UK private portfolio investment overseas	£mn	T	72
KYT	Stock of UK external assets	£mn	I	72
KYUP	Stock of UK private direct investment overseas	£mn	T	72
KYXC	Stock of export credit	£mn	T	72
KY£R	Stock of residual sterling claims of UK banks and companies	£mn	T	72
KZNA	Stock of LZNA	£mn	I	87
KZSD	Stock of LZSD	£mn	I	86
LBG	Bank finance of the PSBR: public	£mn	I	88
LBO£	Bank lending in sterling to overseas sector	£mn	X	
LBP$	Bank lending in foreign currency to UK residents for investment abroad	£mn	X	

Code	Description	Units	Type	No.
LBPO	Bank lending to private sector in foreign currency other than for investment abroad	£mn	X	90
LB£B	Bank lending in sterling to UK private sector: banks	£mn	I	90
LB$B	Bank lending in foreign currency to UK private sector: banks	£mn	B	90
LDB	Bank lending to UK private sector: banks	£mn	I	90
LDI	Bank lending to UK private sector: ICCs	£mn	B	84
LDJ	Bank lending to UK private sector: persons	£mn	B	83
LDV	Bank lending to UK private sector: OFIs	£mn	B	86
LE	Employees in employment (UK)	000's	I	35
LEG	Employment in non-trading public sector (including HM Forces)	000's	B	34
LEMF	Employment in manufacturing industry	000's	B	35
LGI	Public sector lending: ICCs	£mn	X	
LGJ	Public sector lending: persons	£mn	X	
LGO	Public sector lending: overseas	£mn	X	
LGV	Public sector lending: OFIs	£mn	X	
LHBB	Loans for house purchase by banks: banks	£mn	X	
LHMF	Number employed in HM Forces	000's	X	
LHPG	Loans for house purchase by other: public	£mn	X	
LHPV	Loans for house purchase by other: OFIs	£mn	X	
LMCJ	Personal sector money at call	£mn	X	
LOIL	Employment in North Sea oil sector	000's	X	
LOTH	Employment in 'other' sector (mainly nationalised industries and private services)	000's	B	35
LRCG	Credit extended by retailers: public	£mn	X	
LRCI	Credit extended by retailers: ICCs	£mn	X	
LSE	Number of self-employed	000's	X	

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[b] B = behavioural equation; I = identity; T = technical equation; X = exogenous (including dummies).

Listing of variables (continued)

Code	Definition	Data unit[a]	Defined by[b]	Page
LTCG	Net inter-government loans and other long-term capital flows	£mn	X	
LU	Number unemployed excluding school-leavers and adult students (UK)	OOO's	B	35
LU&	Initial estimate of number unemployed (UK)	OOO's	X	
LVG	Life assurance and pension fund receipts: public	£mn	X	
LVJ	Life assurance and pension fund receipts: persons	£mn	T	83
LVOB	Miscellaneous private sector transactions: banks	£mn	X	
LVOI	Miscellaneous private sector transactions: ICCs	£mn	B	84
LVOJ	Miscellaneous private sector transactions: persons	£mn	B	83
LZGL	Building society guideline in terms of new commitments	£mn	T	86
LZI	Deposits with building societies: ICCs	£mn	X	
LZMI	Building societies' receipts of payments of interest	£mn	I	86
LZNA	Net advances on mortgages by building societies: OFIs	£mn	I	87
LZRA	Real net advances on mortgages by building societies	75 £mn	B	87
LZRP	Building society receipts of payments of principal	£mn	B	86
LZSI	Personal sector net receipts of building society interest	£mn	I	87
LZSD	Deposits with building societies: OFIs	£mn	B	86
L£BO	Bank lending in sterling to overseas: overseas	£mn	B	89
M	Imports of goods and services	75 £mn	I	28
M£	Imports of goods and services	£mn	I	29
MG	Imports of goods (BoP)	75 £mn	B	27
MG£	Imports of goods (BoP)	£mn	I	29
MGA1	Imports of ships, aircraft and SITC section 9 (OTS)	75 £mn	X	
MGFD	Imports of food, drink and tobacco (OTS)	75 £mn	B	27
MGIM	Imports of industrial materials, excluding precious stones (OTS)	75 £mn	B	27
MGFM	Imports of finished manufactures (OTS), excluding North Sea equipment, aircraft and ships	75 £mn	B	27
MGNS	Imports of North Sea production equipment (OTS)	75 £mn	X	
MGPS	Imports of precious stones (OTS)	75 £mn	X	

Code	Description	Units	Type	Page
MG2	Imports of fuel (OTS)	75 £mn	I	29
MG2£	Imports of fuel (OTS)	£mn	I	29
MG2N	Net imports of fuel (OTS)	75 £mn	T	29
MII	Miscellaneous inward investment in UK private sector	£mn	X	32
MND	Proxy for the demand for finished manufactured goods	75 £mn	B	29
MPP£	Imports of petroleum and petroleum products	£mn	B	33
MPRL	Effective manufacturing production	75 £mn	I	33
MPRM	Proxy for production of finished manufactured goods	75 £mn	B	32
MPRO	Manufacturing production	75 £mn	I	33
MPRX	Output of food, drink, tobacco and coal and petroleum product industries	75 £mn	X	
MPWE	Imports (excluding fuel) as a percentage of weighted final expenditure	Per cent	T	28
MS	Imports of services	75 £mn	I	27
MS£	Imports of services	£mn	I	29
MSCR	Aggregate married, single and child tax allowances	£mn/qtr	T	59
MSUR	Rate of import surcharge on semi and finished manufactures	Per cent	X	
MULC	UK unit labour costs: manufacturing	1975=1	B	38
M2US	US money supply (M2, quarterly average, stock)	US$ bn	X	
M3£	Flow of sterling money supply	£mn	I	91
NCG	Notes and coin: public	£mn	I	88
NCJ	Notes and coin: persons	£mn	I	82
NDG2	Net demand for oil	75 £mn	B	28
NECO	Number of employees contracting out	000s	X	

[a] Unless otherwise stated, seasonally-adjusted series are used in all cases where the appropriate statistics are available or can be derived.

[b] B = behavioural equation; I = identity; T = technical equation; X = exogenous (including dummies).

Listing of variables (continued)

Code	Definition	Data unit[a]	Defined by[b]	Page
NETX	Net rate of tax on final expenditure	Per cent	I	71
NLAJ	Persons' holdings of net liquid assets (end-quarter)	£mn	I	82
NLJL	Persons' long-run desired holdings of net liquid assets	£mn	T	82
NLJS	Persons' short-run desired holdings of net liquid assets	£mn	B	82
NSO	North Sea oil production	tonnes mn	X	
NTAC	Number claiming child allowance	millions	B	59
NTAM	Number claiming married allowance	millions	B	59
NTAS	Number claiming single allowance	millions	B	59
NTIF	Rent and non-trading income of financial companies	£mn	B	66
NULC	Normalised relative unit labour costs	1975=100	I	52
NULE	Effective normalised relative unit labour costs		I	23
OBML	Other banking and money-market liabilities	£mn	B	78
OCF	Other capital flows	£mn	X	
OCSF	Other commercial short-term flows	£mn	B	78
OICS	Overseas sector portfolio investment in UK private sector	£mn	B	77
OIMC	Other import credit	£mn	B	77
OIPF	Other interest payments by financial companies	£mn	B	66
OIPS	Overseas sector investment in UK public sector	£mn	B	76
OOIL	Outward oil investment	£mn	X	
OOTH	Output of 'other' sector (mainly nationalised industries and private services)			
OOTL	Effective output of 'other' sector	75 £mn	I	33
ORNT	Owner-occupier imputed rent	75 £mn	I	33
OSP	Payments of over-spill relief	£mn	B	58
PB	Price deflator for beer consumption	£mn	X	
PC	Price deflator for total consumption	1975=1	B	46
PCD	Price deflator for consumption of durable goods	1975=1	I	48
PCL	Wholesale price index of coal	1975=1	B	48
PCND	Price deflator for consumption of non-durable items	1975=1	T	46
PCOM	Price index of competing exports	1975=1	B	46
		1975=100	T	43

Code	Description	Units	Type	Page
PCUS	US consumer price index	1975=100	X	35
PDTY	Productivity (GDP per employee)	75 £mn per man	I	49
PEF	Price deflator for total final expenditure	1975=1	I	
PEM$	Proportion of import credit denominated in foreign currency	Ratio	X	
PEO£	Proportion of overseas direct investment in UK private sector denominated in sterling	Ratio	X	
PERK	Pressure on the £/$ exchange rate	Per cent	B	40
PETR	Inland consumption of petroleum products	000 tonnes	I	29
PEXM	Proxy for expected rate of inflation (monetary aggregates)	Per cent	B	50
PEXP	Proxy for expected rate of inflation (prices)	Per cent	T	50
PEXR	Proportion of exchange reserves entering public portfolio investment	Ratio	X	
PFDT	Average value index for imports of food, drink and tobacco	1975=1	B	43
PFL	Average value index for imports of fuel	1975=1	I	43
PFLI	Imputed retail price of consumption of motor spirit	1975=1	T	46
PFLO	Average value index for imports of oil assuming no North Sea oil	1975=1	I	43
PFL$	Average value index for imports of fuel	1975=1 US$	X	
PFO$	World dollar price of oil	1975=1 US$	X	
PG	Price deflator for public authorities' current expenditure	1975=1	B	48
PGDP	Price deflator for GDP (expenditure estimate)	1975=1	I	49
PIF	Price deflator for total fixed investment	1975=1	I	49
PIFG	Price deflator for public fixed investment	1975=1	B	49
PIHP	Price deflator for private residential fixed investment	1975=1	B	47
PIMN	Imputed wholesale price index of manufacturing output (net of tax)	1975=1	T	46
PIMO	Wholesale price index of manufacturing output	1975=1	B	46
PINP	Price deflator for private non-residential fixed investment	1975=1	I	49
PINS	Price deflator for fixed investment in shipping	1975=1	B	47
PIRS	Price deflator for other private fixed investment	1975=1	I	48
PM	Price deflator for imports of goods and services	1975=1	I	44
PMA	Adjusted price deflator for imports of goods and services	1975=1	T	44
PMAM	Adjusted price deflator for imports of goods and services, excluding finished manufactures	1975=1	I	44
PMG	Price deflator for imports of goods	1975=1	B	44

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[b] B = behavioural equation;   I = identity;   T = technical equation;   X = exogenous (including dummies).

Listing of variables (continued)

Code	Definition	Data unit[a]	Defined by[b]	Page
PMGA	Adjusted price deflator for imports of goods	1975=1	I	44
PMIM	Average value index for imports of industrial materials	1975=1	B	43
PMM	Average value index for imports of finished manufactures and miscellaneous	1975=1	B	44
PMS	Price deflator for imports of services	1975=1	B	44
PNH	Unit value of houses mortgaged by building societies	1975=1	B	48
POP	Population: males age 15-64, females age 15-59	000's	X	35
POWA	Population of working age excluding those in full-time education	000's	I	49
PPMD	Price deflator for plant and machinery investment in manufacturing	1975=1	B	49
PPMM	Price deflator for plant and machinery investment in distribution and services	1975=1	B	49
PROM	Index of manufacturing production	1975=100	I	33
PS	Price deflator for stock levels	1975=1	B	49
PSBR	Public sector borrowing requirement	£mn	I	88
PT	Price deflator for tobacco consumption	1975=1	B	47
PVIB	Price deflator for investment in vehicles and industrial buildings	1975=1	B	47
PWS	Price deflator for consumption of wines and spirits	1975=1	B	47
PX	Price deflator for exports of goods and services	1975=1	I	51
PXG	Price deflator for exports of goods	1975=1	I	51
PXGA	Price deflator for exports of goods excluding fuel	1975=1	B	51
PXGM	Price deflator for exports of manufactured goods	1975=1	B	51
PXG2	Price deflator for exports of fuel	1975=1	I	51
PXNM	Price deflator for exports of non-oil, non-manufactured goods	1975=1	B	51
PXS	Price deflator for exports of services	1975=1	B	51
PXWM	Price of world exports of manufactures	1975=1 US$	X	
PX2A	Price deflator for exports of fuel other than North Sea oil	1975=1	I	51
PX2B	Price deflator for exports of North Sea oil	1975=1	I	51
PZSP, PZSN	Pressure on the building societies' share rate		B	54
PZA$	Price deflator for exports of fuel other than North Sea oil	1975=1 US$	X	

Code	Description	Unit	Type	Page
P2B$	Price deflator for exports of North Sea oil	1975=1 US$	X	
QVAR	Number of quarters since last change in building society share rate		X	
Q1	Seasonal dummy for quarter 1		X	
Q2	Seasonal dummy for quarter 2		X	
Q3	Seasonal dummy for quarter 3		X	
Q4	Seasonal dummy for quarter 4		X	
R$	Flow of reserves	US$ mn	B	41
R$E	Expected change in reserves	US$ mn	B	41
RACT	Rate of advance corporation tax	Per cent	X	
RBG	Rate of duty on betting and gaming	Per cent	X	
RCBR	Clearing banks' base rate	Per cent	T	54
RCD	Three-month sterling certificate of deposit rate	Per cent	T	53
RDT	Rate of customs and excise duty on tobacco	Per cent	X	
REB$	Rate of return on UK banks' net liabilities in foreign currency	Per cent	T	73
REGL	Rate of return on inter-government loans to UK	Per cent	X	
REHM	Rate of interest of HMG loan	Per cent	T	74
REIM	Rate of interest on IMF position	Per cent	X	
REOL	Rate of return on inward private oil investment	Per cent	T	73
RESB	Unidentified financial transactions: banks	£mn	I	91
RESE	Residual error in national income accounts	£mn	X	
RESG	Unidentified financial transactions: public	£mn	X	
RESJ	Unidentified financial transactions: persons	£mn	X	
RESO	Unidentified financial transactions: overseas	£mn	I	89
RESS	Net non-deposit liabilities	£mn	X	
RESV	Unidentified financial transactions: OFIs	£mn	X	
RES£	Rate of return on inward private sterling portfolio investment	Per cent	X	
REUE	Three-month euro-dollar rate (end-quarter)	Per cent	X	
REUP	Rate of return on inward private direct investment	Per cent	T	73
REU$	Three-month euro-dollar rate (quarterly average)	Per cent	T	54
RFDE	Forward discount rate on sterling (end-quarter)	Per cent	B	42
RFDS	Forward discount rate on sterling (quarterly average)	Per cent	B	42
RFE	Aggregate rate for employers' flat-rate contributions	£/wk	T	61

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[b] B = behavioural equation; I = identity; T = technical equation; X = exogenous (including dummies).

Listing of variables (continued)

Code	Definition	Data unit[a]	Defined by[b]	Page
RFJ	Aggregate rate for employees' flat-rate contributions	£/wk	T	61
RFSJ	Self-employed flat-rate contributions	£/wk	T	61
RHCO	Rate of duty on hydrocarbon oil	Pence/£	T	69
RHT	Implicit average tax rate on households' income (excluding current grants)	Per cent	I	59
RJGO	Ratio of the rate of other current grants to the initial estimate	Ratio	T	56
RLA	Local authority three-month rate (quarterly average)	Per cent	I	53
RLAE	Local authority three-month rate (end-quarter)	Per cent	B	53
RLB	Minimum lending rate	Per cent	I	53
RMD	Effective minimum deposit rate for durables	Per cent	X	
RMG	Gross mortgage rate, end-quarter	Per cent	B	54
RNSR	Rate of North Sea oil and gas royalties	Per cent	X	
ROOT	Ratio of owner-occupied to total dwellings in GB	Ratio	B	57
RPCC	Ratio of the total factor income of public corporations to that of companies	Ratio	X	
RPDI	Real personal disposable income	75 £mn	I	63
RPT	Effective rate of purchase tax	Ratio	X	
RRB£	Ratio of the rate of return on UK banks' external sterling liabilities to the LA three-month rate	Ratio	X	
RRME	Ratio of the rate of return on sterling import credit to the LA three-month rate	Ratio	X	
RRM$	Ratio of the rate of return on foreign currency import credit to the three-month euro-dollar rate	Ratio	X	
RRWT	% of change in real value of personal taxes that results in equivalent changes in wage settlements	Per cent	X	
RRXC	Ratio of the rate of return on export credit to the LA three-month rate	Ratio	X	
RSG	Building societies' gross share rate, end-quarter	Per cent	I	54
RSN	Building societies' net share rate, end-quarter	Per cent	B	54
RTAC	Average rate of child allowance	£/yr	T	58
RTAM	Rate of married tax allowance	£/yr	T	58
RTAS	Rate of single tax allowance	£/yr	T	58

Code	Description	Unit	Type	Page
RTWP	Ratio of trade to naturally-weighted OECD industrial production	Ratio	X	
RUB	Estimated average rate of unemployment benefit	£/wk	T	56
RUKG	Rate on long-term (20 years) UK government stock	Per cent	B	53
RUSG	US bond yield (secondary market, 10 years or more)	Per cent	X	
RVHC	Rate of VAT on hydrocarbon oil	Per cent	X	
RYGL	Rate of return on inter-government loans by UK	Per cent	X	
RYOL	Rate of return on outward private oil investment	Per cent	T	72
RYSR	Rate of return on outward private portfolio investment	Per cent	X	
RYUP	Rate of return on outward private direct investment	Per cent	T	72
RZMG	Interest rate on building society mortgages	Per cent	B	54
RZSG	Gross rate of interest on building society shares	Per cent	B	54
RZSN	Net rate of interest on building society shares	Per cent	I	54
SC	Corporate saving	£mn	I	66
SCD	Proxy for the stock of consumer durables	75 £mn	T	15
SCDE	Proxy for the stock of consumer durables	£mn	I	15
SG	Public sector current surplus	£mn	I	67
SJ	Persons' saving	£mn	I	62
SPUK	UK share prices index	1975=100	X	
SPUS	US share prices index	1975=100	X	
SR	Saving ratio	Per cent	I	63
STKJ	Proxy for personal sector stock relief	£mn	T	59
STKR	Company sector stock relief	£mn	T	64
SWI,SWIU	Banks' net foreign currency position (assets +)	£mn	B	77
TADJ	Central government residual taxes on expenditure including stamp duties and betting and gaming duties	£mn	X	
TARR	Reduction in income tax due to the existence of reduced rates	£mn	T	60
TAXJ	Proportion of bank interest charges not offsettable against personal tax	Ratio	X	
TB	Customs and excise duties on beer	£mn	B	69

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[b] B = behavioural equation; I = identity; T = technical equation; X = exogenous (including dummies).

Listing of variables (continued)

Code	Definition	Data unit[a]	Defined by[b]	Page
TCAR	Rate of car tax (on wholesale prices)	Per cent	X	
TCR	Building societies' composite tax rate	Per cent	X	
TE	Receipts by government of taxes on expenditure	£mn	I	71
TEMP	Mean daily air temperature (deviation from average)	°centigrade	X	
TES	Estimated net number of jobs created/preserved by temporary employment measures	OOO's	X	
TGG	Taxes on current grants to persons	£mn	T	60
TGR	Effective tax rate on current grants from public sector	Ratio	X	
THCO	Taxes on hydrocarbon oil	£mn	B	69
TIME	Time trend starting in 1955 Q1		X	
TMVD	Motor vehicle duties	£mn	T	68
TOJ	Overseas taxes paid by the personal sector	£mn	X	
TPR	Petroleum revenue tax	£mn	X	
TPRM	Protective duties including import surcharge and agricultural levies	£mn	B	71
TRAT	Local authority receipts of rates	£mn	B	70
TRCD	Rate of purchase tax on consumer durables/higher rate of VAT	Per cent	X	
TREF	Implicit deflator for factor cost adjustment	1975=1	I	30
TRY	Standard rate of income tax	Per cent	X	
TRYC	Annual tax rate on corporate income	Per cent	X	
TRYE	Basic/standard tax rate on income subject to full earned income relief	Per cent	T	58
TRYK	Rate of investment income surcharge on investment income in the £1,000-£2,000 per annum range	Per cent	X	
TRYU	Implicit average higher tax rate	Per cent	T	58

Code	Description	Units	Type[b]	
TRY1	Rate of investment income surcharge on investment incomes above £2,000 per annum	Per cent	X	
TSET	Selective employment tax receipts	£mn	X	
TT	Customs and excise duties on tobacco	£mn	B	70
TWIP	OECD trade-weighted industrial production	1975=100	I	92
TWS	Customs and excise duties on wines and spirits	£mn	B	70
TYC	Corporate payments of UK income tax	£mn	I	65
TYCM	Proxy for payments of mainstream corporation tax	£mn	B	65
TYJ	Personal sector payments of UK income tax	£mn	B	60
TYJC	Intermediate calculation in the determination of TYJ	£mn	T	60
TYJI	Proxy for the revenue from the investment income surcharge	£mn	T	60
TYJU	Proxy for payments of surtax/higher rate tax	£mn	T	60
TYO	UK income tax paid by the overseas sector	£mn	X	
TYV	Tax payments by life assurance companies and pension funds	£mn	X	
ULC	Unit labour costs	£/75£	I	38
UMC	Import costs per unit of GDP	£/75£	I	44
UMIM	UVI for imports of industrial materials	1975=1	I	43
UMI$	$ UVI of imports of industrial materials	1975=1	B	43
UMM	UVI for imports of finished manufactures and miscellaneous	1975=1	I	44
UMM$	$ UVI for imports of finished manufactures	1975=1	B	43
UNRP	Unremitted profits: UK private sector	£mn	B	78
UR	Rate of unemployment	Per cent	I	35
UVF1	$ UVI of non-CAP imports	1975=1	X	
UVF2	$ UVI of CAP non-EEC imports	1975=1	X	
UVF3	Units of account UVI of CAP EEC imports	1975=1	X	
UVIF	£ UVI of imports of food, drink and tobacco	1975=1	B	43
UVIS	Aggregate simplified £ UVI of food, drink and tobacco	1975=1	T	43
UXGM	Unit value index of exports of manufactures	1975=100	B	51
VATS	Standard rate of VAT	Per cent	X	
WAEM	Index of average earnings in manufacturing	Jan.1970=100	I	38
WER	World/dollar exchange rate: US$ per unit of foreign currency	1975=1	X	

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[b] B = behavioural equation; I = identity; T = technical equation; X = exogenous (including dummies).

Listing of variables (continued)

Code	Definition	Data unit[a]	Defined by[b]	Page
WFP	Average forces' pay	£mn per 1,000	T	38
WIP	OECD naturally-weighted industrial production	1975=100	X	38
WS	Actual average weekly wages and salaries	£	B	38
WSE	Average self-employment income	£mn	B	38
WSU	Usual average weekly wages and salaries	£	B	38
WSU&	Initial estimate of WSU	£	X	
WSN	Average weekly normal wages and salaries	£	B	38
WTM	UK weighted world import volumes (all goods)	1975=100	I	92
WTM1	OECD component of WTM	1975=100	B	92
WTM2	Rest of world component of WTM	1975=100	X	
WTX	World trade in exports: volume index	1975=100	B	92
WULC	Competitors' unit labour costs: manufacturing	1975=1	X	
WWT1	Weights used in WTM1 equation		X	
X	Exports of goods and services	75 £mn	I	25
X£	Exports of goods and services	£mn	I	25
XG	Exports of goods (BoP)	75 £mn	B	25
XG£	Exports of goods (BoP)	£mn	I	25
XGA1	Exports of ships, aircraft, North Sea installations and SITC section 9 (OTS)	75 £mn	B	24
XGBM	Exports of basic materials and semi-manufactures (OTS)	75 £mn	B	24
XGFD	Exports of food, drink and tobacco (OTS)	75 £mn	B	24
XGMA	Exports of manufactures excluding ships, aircraft, North Sea installations and precious stones (OTS)	75 £mn	B	23
XGNO	Exports of non-manufactures excluding oil (OTS)	75 £mn	I	25
XGPS	Exports of precious stones (OTS)	75 £mn	X	
XG2	Exports of fuel (OTS)	75 £mn	I	24
XG2£	Exports of fuel (OTS)	£mn	I	25
XG2A	Exports of fuel other than North Sea oil (OTS)	75 £mn	B	24
XG2B	Exports of North Sea oil (OTS)	75 £mn	B	24
XOGO	Other external finance: overseas	£mn	B	89
XPP£	Exports of petroleum and petroleum products (OTS)	£mn	B	25

Code	Description	Units	Type	Page
XPRF	Proxy for relative profitability of exports	1975=100	I	52
XRS£	Change in exchange reserves in £ held by CMIs	£mn	I	78
XRSB	Change in exchange reserves in £ held by CMIs: claims on banking sector	£mn	X	
XRSG	Change in exchange reserves in £ held by CMIs: claims on public sector	£mn	X	
XRSO	Change in exchange reserves in £ held by CMIs: other	£mn	X	
XS	Exports of services	75 £mn	I	25
XS£	Exports of services	£mn	I	25
XSGS	Government services: credits	75 £mn	B	25
XSSH	Shipping: credits	75 £mn	B	25
XSTC	Civil aviation, travel and other services: credits	75 £mn	B	25
YC	Total corporate income	£mn	I	64
YCAB	Corporate income from abroad	£mn	T	64
YCDL	Proxy for permanent non-grant real personal disposable income	75 £mn	T	63
YCNT	Corporate rent and non-trading income	£mn	B	64
YCTP	Company gross trading profits	£mn	I	64
YCTR	Company trading profits net of stock appreciation	£mn	I	64
YD	Personal disposable income	£mn	I	62
YDIJ	Personal income from dividends and net interest	£mn	I	58
YDPM	Proxy for permanent non-grant personal income	75 £mn	T	63
YEC	Employers' contributions	£mn	I	58
YECN	Employers' national insurance contributions	£mn	B	62
YECO	Employers' other contributions	£mn	B	58
YECS	Accruals of the national insurance surcharge	£mn	I	70
YFP	Forces' pay	£mn	I	57
YGC	Public sector total current receipts	£mn	I	67
YGRA	Public sector income from rent and non-trading capital, dividends and interest	£mn	B	67
YGTA	Public sector gross trading surplus	£mn	B	67

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[b] B = behavioural equation; I = identity; T = technical equation; X = exogenous (including dummies).

YYGL	Earnings from inter-government loans by UK	£mn	T		72
YYOL	Earnings from private oil investment overseas	£mn	X		
YYOT	Interest, profits and dividends other than on private investment: credits	£mn	I		72
YYPA	Interest, profits and dividends: credits	£mn	I		72
YYRO	Earnings from other reserves	£mn	T		72
YYSR	Earnings from private portfolio investment	£mn	T		72
YYUP	Earnings from private direct investment	£mn	B		72
YYXC	Earnings from export credit	£mn	T		72
YY£R	Earnings from residual sterling claims of UK banks and companies	£mn	T		72
ZLIQ	Proxy for building societies' liquidity position	Per cent	I		87

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[b] B = behavioural equation; I = identity; T = technical equation; X = exogenous (including dummies).

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