Office for
Budget Responsibility

Briefing paper No. 5

The macroeconomic model

October 2013

Any queries regarding this publication should be sent to us at: obrenquiries@obr.gsi.gov.uk

ISBN 978-1-909790-28-5
PU1558

Contents

1 Introduction

1.1 The Office for Budget Responsibility (OBR) was created to examine and report on the UK's public finances. To that end, we publish five-year forecasts for the key components of the public finances twice a year, alongside each Budget and Autumn Statement. But the evolution of the public finances depends to a considerable degree on the evolution of the economy. So, to generate a forecast for the public finances, we also need to forecast the outlook for the economy.

1.2 The key features of each forecast reflect judgements made by the OBR's Budget Responsibility Committee, working with our full-time staff. To help flesh out the details of the forecast, we use a large-scale macroeconomic model originally developed by the Treasury in 1970[1] and updated and improved subsequently on a continuing basis. Since June 2010, the model has been maintained and developed by the OBR and the Treasury jointly. A Memorandum of Understanding[2] sets out the governance arrangements for this shared ownership. Co-ownership of the model in no way compromises the ability of the OBR to forecast independently of Government. We have complete freedom over the version of the model that we use and could adopt an alternative if we so wished.

1.3 It is also important to emphasise that the model is a computational tool and considerable human judgement must be applied to produce a coherent forecast. Two forecasters using exactly the same model could end up with very different forecasts because the judgements underpinning them differ.[3] That said, using a model helps ensure that judgements are applied in a mutually consistent way. A model can also be used to generate consistent forecasts for a large range of variables from a smaller set of key judgements.

[1] Chan, A., Savage, D., and Whittaker, R., *The New Treasury Model*, Government Economic Service Working Paper no. 128.

[2] http://budgetresponsibility.independent.gov.uk/wordpress/docs/MoU_model.pdf.

[3] For example, the ITEM club have used the 2008 version of the macroeconomic model to produce their forecasts, which have regularly differed from official forecasts produced using the same model.

1.4 This paper describes the version of the model in use as of October 2013, but it will continue to be revised on an ongoing basis. The previous written description of the model was published by the Treasury in 2008.[4]

The model and the economic forecast

1.5 The macroeconomic model is a simplified representation of the economic activity described and recorded in the National Accounts published by the Office for National Statistics (ONS). The equations in the model represent a set of relationships between different economic variables. These relationships can be broken down into three broad groups:

- **accounting identities:** equations that specify the identities and definitions in the National Accounts. Examples include the identity that real Gross Domestic Product by definition equals the sum of consumption, investment, government spending and net trade, and that nominal consumption is the product of real consumption and the consumption deflator;

- **behavioural (or econometric) equations:** econometrically estimated equations based on economic theory and statistical analyses of how the economy has behaved in the past. For example, the behavioural equation for households' spending assumes that it responds to changes in real incomes, interest rates and wealth as it has in the past. But no theory fits the data perfectly, and the forecaster is always free to make the judgement that it will now behave differently; and

- **technical relationships:** equations in the model that are neither identities nor econometrically estimated. This category includes calibrated relationships based on economic theory or broad historical trends and stylised forecasting assumptions – such as the assumption that employees' contributions to pension schemes remain constant as a share of total wages and salaries.

The role of judgement

1.6 All models are necessarily simplifications of reality. And forecasters are typically confronted with at least some behavioural equations that do not explain the recent past well, particularly if there have been significant structural changes in the economy. Under these circumstances, the 'residuals' of the equations – the elements of unexplained behaviour represented by the difference between outturns and the model's output – will be relatively large. Accordingly the

[4] http://data.parliament.uk/DepositedPapers/Files/DEP2009-2901/DEP2009-2901.pdf

forecaster has to attempt to interpret the path of residuals implied by the model and judge how the unexplained behaviour will evolve over the forecast period.

- In these cases it makes sense to use a range of approaches and models to inform the forecast, rather than to rely solely on the behavioural relationship implied by the model, which will reflect the behaviour of the economy over the specific time period over which the relationships were estimated.[5,6] For example:

- the forecast path for a particular variable may be informed by historical evidence, including comparable episodes or long-run trends;

- the 'residuals' or unexplained errors in the behavioural equations in the macroeconomic model can also inform the forecast;

- in some cases, the appropriate judgement is captured by technical relationships or identities specified by the model;

- for other variables, the forecast judgement is based on auxiliary models outside the main macroeconomic model; and

- for certain variables, the judgement is to adopt an external conditioning variable, such as market expectations of interest rates and oil prices.

Imposed variables

1.7 Some variables that appear in the model are actually determined outside it. For the purposes of this document, we refer to these as 'imposed' variables. In some cases they will be 'exogenous' variables, imposed by assumption. For example, we assume that oil prices and interest rates will move in line with the expectations embodied in financial market prices at the time of the forecast.

1.8 In other cases, the variables are 'endogenous' – determined by other variables – but imposed on the main macroeconomic model having been estimated using other models. Often, these variables are imposed because the methods used to forecast them cannot practically be contained within our main macroeconomic model. For example, the forecast for tax receipts is endogenous – it is determined

[5] For more discussion of the use of judgement in forecasting, see OBR, 2011, *Forecasting the economy*; and Burgess et al, 2013, *The Bank of England's forecasting platform: COMPASS, MAPS, EASE and the suite of models*.

[6] Indeed, given that the model includes a number of imposed variables that are determined outside the forecast, it would not be possible to derive a considered and plausible result in the absence of alternative models and judgement.

by variables such as wages, profits and consumer spending. But tax receipts are imposed on the main macroeconomic model having been calculated using the models for individual taxes run for the OBR by HM Revenue & Customs.[7]

1.9 Potential output – the level of economic activity consistent with stable inflation – is another variable estimated outside the macroeconomic model and then imposed on it. In this instance there are a range of methods that we could use, many of which do not lend themselves well to inclusion in a large-scale macroeconomic model.

1.10 Our general approach to forecasting potential output is to begin by estimating the current output gap – the difference between potential and actual output. To this end, we use a range of methodological approaches, including evidence from cyclical indicators.[8] We then estimate how potential output will evolve by splitting up growth in potential into several components that are analysed and projected separately: productivity growth (output per hour); average hours growth; employment rate growth and population growth. A variety of approaches are used to project these components, all of which operate outside the macroeconomic model. The resulting forecast is then imposed on the macroeconomic model, via the potential output variable defined in the model.

1.11 Variables imposed on the model have to be formally specified in the code as an equation depending on other variables or past values of the same variable in order to ensure a model solution. So for simplicity we specify in the code that they remain constant at their most recent outturn value. So, for an imposed variable X:

$$X = X(-1)$$

1.12 In practice, however, the imposed values of the variables override this equation.[9] The equation should not be interpreted as an assumption that the imposed variables equal their most recent outturn values over the forecast.

Features of the model

1.13 Our ultimate objective is to forecast the outlook for the public finances, so the model is designed to help generate a macroeconomic forecast suitable for that particular purpose. As tax receipts and government spending are strongly influenced by variables such as nominal GDP, consumer spending, wages and

[7] For more details of the OBR's approach to forecasting the public finances, see OBR, 2011, *Forecasting the public finances*.

[8] See Pybus, T, 2011, *Working Paper No.1: Estimating the UK's historical output gap*.

[9] In this (extreme) case all of the variation in an imposed variable will be explained by the equation residual.

salaries and corporate profits, we require a more detailed forecast of the expenditure and income measures of nominal GDP than many forecasters in the private sector or academia would require. Accordingly, the macroeconomic model includes a detailed treatment of these aspects of the economy.

1.14 Our macroeconomic model shares a number of features with those used by other UK forecasting institutions. For example, COMPASS, the central organising model used by the Bank of England,[10] and NiGEM, the global macro-econometric model operated by the National Institute for Economic and Social Research (NIESR)[11] are both macroeconomic models that are underpinned by economic theory and informed by the data – like our model – and feature a similar set of variables.[12] (That said, COMPASS is a much smaller model than ours and many of the variables that appear in our model appear in a supplementary 'Post-Transformation Model' (PTM).) There are also similarities in the structure of individual equations. For example, all three models include equations specifying prices as a mark-up over unit costs, while exchange rates are determined by an uncovered interest parity condition.

1.15 But there are also differences between these models, which in part reflect the different purposes they serve. The OBR model and NiGEM are both large scale macro-econometric models. By contrast, COMPASS belongs to the class of Dynamic Stochastic General Equilibrium (DSGE) models, which are commonly used in central banks. In addition to being smaller than traditional large-scale macro-econometric models, DSGE models place greater emphasis on what their designers regard as desirable theoretical properties – in particular, microeconomic foundations, such as the specification of a utility maximising household to determine consumption behaviour. By contrast, there is no specified household utility function in the OBR model; consumer behaviour is determined at the macroeconomic level as an empirical relationship between total consumption and other macroeconomic variables, such as total labour income.

1.16 Central banks find the size and theoretical coherence of DSGE models particularly attractive given their need to simulate and compare the implications of different policy paths. We use our model primarily to generate a central forecast, based on current government policy, so we are happy to forego some of the theoretical features that DSGE users find attractive in order to be able to handle the much larger number of forecast variables we publish and to be able

[10] See Burgess et al, 2013, *The Bank of England's forecasting platform: COMPASS, MAPS, EASE and the suite of models*.

[11] Background material on NiGEM can be found at http://nimodel.niesr.ac.uk/.

to impose judgements more flexibly. But, given the relatively cumbersome nature of our main model, we also use a dedicated 'small model' to help generate the alternative scenarios we use to help illustrate the sensitivity of our central forecast to particular judgements. This model is described in Murray (2012).

1.17 The three macroeconomic models also differ in scope. NiGEM is a global model and therefore includes a significantly more detailed treatment of the rest of the world than either COMPASS or the OBR macroeconomic model. Similarly, the OBR macroeconomic model contains a more detailed treatment of public sector variables than NiGEM or COMPASS, reflecting the fact that our macroeconomic forecast is ultimately required as an input into our public finance forecast.

1.18 The recent financial crisis exposed a number of gaps in the macroeconomic models used by policy institutions. For example, many of the models used by central banks and finance ministries failed to include a well articulated representation of the financial sector – a gap that also applies to the System of National Accounts itself. While efforts have been made to develop the role of the financial sector in macroeconomic models, research in this area is ongoing.

1.19 In common with many models, our own macroeconomic model does not feature a fully articulated banking sector. However, this does not mean that our economic forecast is independent of financial sector developments and their implications. The outlook for credit conditions is reflected implicitly through our forecasts of both the economy's potential level of output and cyclical movements around it. For example, in producing our potential output forecast we consider the functioning of the banking sector and its ability to allocate capital efficiently. Similarly, the prospects for aggregate demand are assessed with a view to both the monetary policy stance and the wedge between policy rates and the lending rates experienced by borrowers and savers in the wider economy.

The structure of the paper

1.20 Chapters 2 to 8 set out the main description of the model. Throughout the document, variable equations are written using the notation as it appears in the model code; a glossary of notation is set out in Annex A. Variables in the model are organised into groups. At the beginning of each group there is a factual outline and diagram of the major variables. The notes for each variable set out the variable name and describe the nature of the data, their source and the unit of measurement. We provide ONS identifiers wherever possible. All data are seasonally adjusted unless otherwise stated. For each behavioural equation a summary of the equation properties is normally given, including static long-run elasticities and shorter-term dynamic responses to changes in some of the explanatory variables.

1.21 The 'macroeconomic model' is defined here as the model code, as set out in full in Annex B. The supporting code file is available on request. The model code is provided to users for their use based on their own assumptions. As such, results produced by the model do not constitute the views of the OBR or the Treasury, nor are they to be regarded as OBR or Treasury forecasts. The model code is set out and provided 'as is', without any representation or endorsement made and without warranty of any kind. We do not warrant that the functions contained in the model are error free, and in no event will be liable for any loss or damage whatsoever arising from its use.

1.22 The model code is operated, read and solved using Winsolve, a program for solving and simulating non-linear models. More information about Winsolve can be found at http://www.econ.surrey.ac.uk/winsolve/.

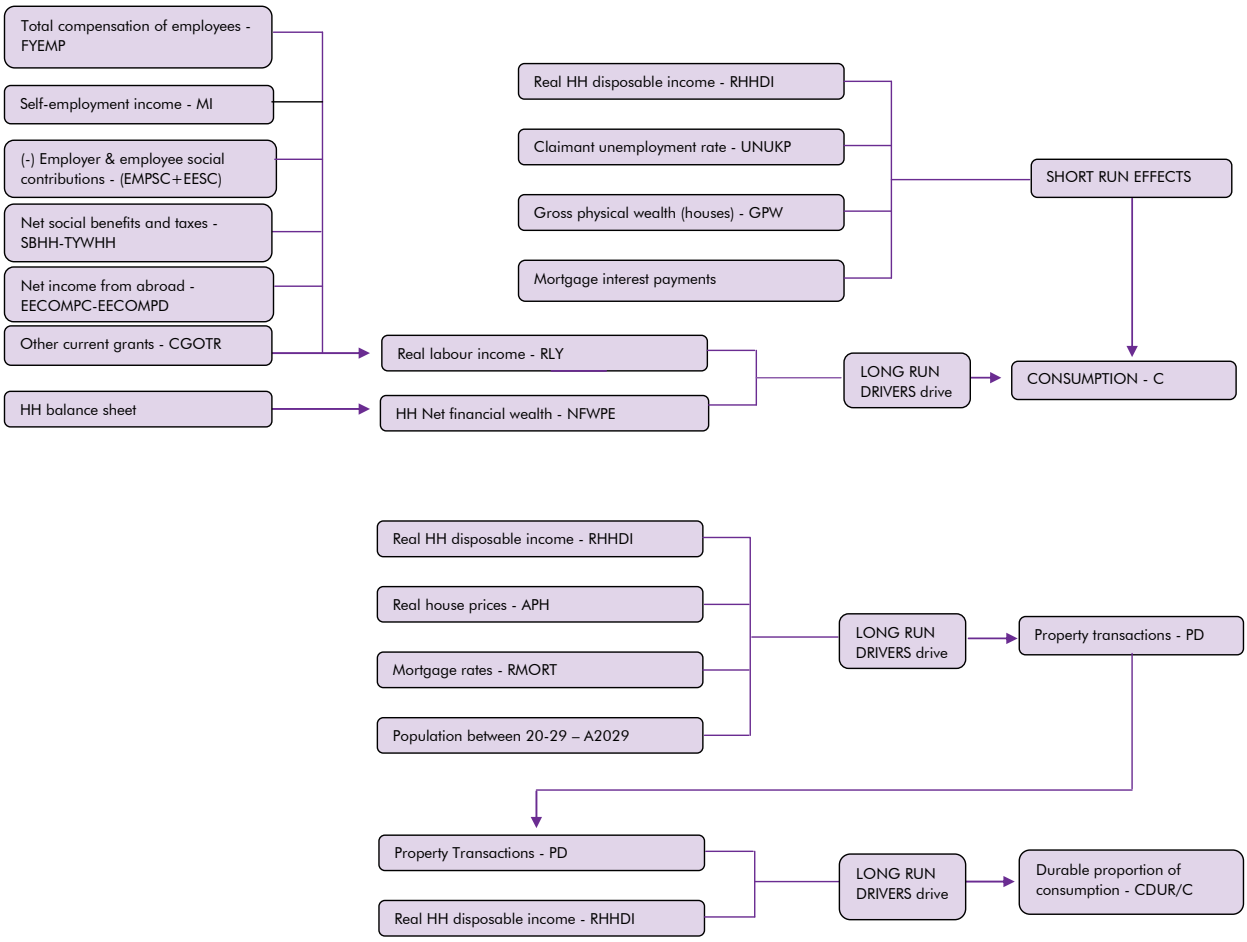
1.23 The macroeconomic model is continually refined, developed and updated. This includes incorporating changes to the structure, composition and classification of data sources; re-estimating behavioural equations as appropriate to take on board new data or theoretical advances; and other refinements to develop the overall coherence and consistency of the model. As time and resources allow, we plan to update these notes on a regular basis to ensure that significant changes are captured in the documentation.

2 Expenditure components of GDP

Consumption

This group contains the main behavioural equations for consumption, as well as equations for consumers' expenditure on durables and property transactions.

Figure 2.1: Consumption



Household[1] consumption (C)

Model equation: Behavioural variable

$$
\begin{aligned}
dlog(C) = \quad & -0.13*log((C(-1)/RLY(-1)) - 0.11*dlog(C(-1)) \\
& \quad (3.39) \qquad\qquad\qquad (1.47) \\
& + 0.005*log((100*NFWPE(-1))/(PCE(-1)*RLY(-1))) \\
& \quad (1.93) \\
& + 0.19*dlog(RHHDI) + 0.09*dlog(RHHDI(-1)) \\
& \quad (4.23) \qquad\qquad (1.66) \\
& - 0.14*dlog(RHHDI(-2)) + 0.15*(dlog(GPW)-dlog(PCE)) \\
& \quad (3.00) \qquad\qquad\qquad (4.02) \\
& - 0.01diff(UNUKP) - 0.0007diff(RS) + 0.02 \\
& \quad (2.68) \qquad\qquad (1.17) \\
& + 0.0003*T1 - 0.0001*T2 \\
& \quad (2.10) \qquad (1.46) \\
& - 0.22*d(MORT(-1)/RHHDI(-1)) \\
& \quad (2.41) \\
& + 0.040*DD792 \\
& \quad (7.26)
\end{aligned}
\qquad (2.1)
$$

Unit: £m, CVM **Source:** ONS **Identifier:** ABJR+HAYO

where:

$$RLY = 100*(CGOTR - GNP4 - CGTPC + MI + FYEMP + EECOMPC - EECOMPD - EMPSC - EESC + SBHH - TYWHH)/PCE$$

$$MORT = 100*LHP*((((1+(RHF/100))\,\hat{}\,0.25)/100)-1)/PCE$$

Equation properties

Estimation period: 1972Q1 to 2002Q4.

Adjusted $R^2 = 0.62$

Static long-run solution:

$$log\ C = 0.96*log(RLY) + 0.04*log(NFWPE/PCE) + 0.15$$

[1] Including non-profit institutions serving households (NPISH).

Elasticity of C with respect to a 1% increase in:

	Q1	Q5	Q9	Long-run
Real labour income (RLY)	0.12%	0.45%	0.65%	0.96%
Real financial wealth (NFWPE/PCE)	0.01%	0.02%	0.03%	0.04%
Real housing wealth (GPW/PCE)	0.11%	0.07%	0.04%	0.00%
Nominal interest rate (RS)[2]	-0.0005%	-0.0003%	-0.0002%	0.00%
Real household disposable income (RHHDI)	0.24%	0.06%	0.03%	0.00%
Unemployment rate (UNUKP)	-0.006%	-0.004%	-0.002%	0.00%
Real value of mortgages (MORT)	-0.22%	-0.12%	-0.07%	0.00%

Comment: This is the major behavioural equation of this group. The main explanatory variables for consumption are real labour income and real financial wealth, representing current and expected lifetime resources. Long-run homogeneity with respect to real labour income and wealth is imposed.

There are additional short-run dynamic effects from real disposable income, short-term interest rates, real mortgage payments and unemployment. The short-term interest rate may capture the cost of borrowing or credit rationing effects. The time trend variables attempt to capture the effects of financial deregulation and the increase in precautionary saving associated with the recession of the early 1990s.

Nominal household[3] consumption (C£)

Model equation: Technical relationship (identity)

$$C£ = C^{*}PCE/100 \qquad (2.2)$$

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *RPQM*

[2] Semi-elasticity.

[3] Including non-profit institutions serving households (NPISH).

Household consumption: durable goods (CDUR)

Model equation: Behavioural variable

$$
\begin{aligned}
CDUR = \; & C*(0.82*(CDUR(-1)/C(-1)) + \underset{(16.19)}{} \; 0.01*\log(RHHDI) \underset{(0.96)}{} \\
& + 0.002*\log(NFWPE/PCE) \underset{(1.17)}{} + 0.003*\log(PD) \underset{(2.23)}{} \\
& + 0.004*\log(CDUC) \underset{(4.65)}{} - 0.01*\log(CDUC(-1)) \underset{(-5.83)}{} \\
& - 0.02*\log(RPCDUR) \underset{(-2.96)}{} \\
& - 0.0002*T77 \underset{(-1.24)}{} - 0.12) \underset{(-0.98)}{}
\end{aligned}
\qquad (2.3)
$$

Unit: *£m, CVM* ***Source:*** *ONS* ***Identifier:*** *UTID*

where:

$$
CDUC = PCDUR*((((1 + (R/100))\,\hat{}\,0.25) - 1) + ((1.25\,\hat{}\,0.25) - 1) - (diff((PCDUR)/PCDUR))
$$

$$
RPCDUR = (PCDUR/PCE)
$$

Equation properties:

Estimation period: 1977Q3 to 2009Q2

Adjusted $R^2 = 0.99$

Static long-run solution:

$$
\begin{aligned}
CDUR = \; & C*(0.06*\log(RHHDI) + 0.01*\log(NFWPE/PCE) + 0.01*\log(PD) \\
& - 0.01*\log(CDUC) - 0.13*\log(RPCDUR) \\
& - 0.0009*time(197701) - 0.67)
\end{aligned}
$$

Semi-elasticity of (CDUR/C) with respect to a 1% increase in:

	Q1	Q5	Q9	Long-run
Real household disposable income (RHHDI)	0.02%	0.04%	0.05%	0.06%
Real household net financial assets (NFWPE/PCE)	0.00%	0.01%	0.01%	0.01%
Property transactions (PD)	0.00%	0.01%	0.01%	0.01%
User cost of consumer durables (CDUC)	0.002%	-0.001%	-0.003%	-0.005%
Relative price of consumer durables (PCDUR/PCE)	-0.04%	-0.09%	-0.11%	-0.13%

Comment: The equation for the durable share of consumption (CDUR/C) can be viewed as a partial adjustment model of consumers' desired stock of durables, with the desired stock a function of income, wealth, relative prices, residential property transactions and the user cost of durables. The relative price of consumer durables and the user cost are both included, with the latter representing a proxy for future changes in the value of the stock. The property transaction term may capture durable consumption associated with house purchases.

Household consumption: durables (nominal) (CDUR£)

Model equation: Technical relationship (identity)

*CDUR£ = (PCDUR/100)*CDUR* (2.4)

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *UTIB*

Numbers in 20-29 age group (A2029)

Model equation: Imposed variable

A2029 = A2029(-1) (2.5)

Unit: *000s* ***Source:*** *ONS* ***Identifier:*** *KABB*

Property transactions (PD)

Model equation: Behavioural variable

$$
\begin{aligned}
dlog(PD) = \; & -0.11*log(PD(-1)) \underset{(-3.7)}{} + \underset{}{} 0.25*log(RHHDI(-1)) \underset{(2.7)}{} \\
& -0.22*log(RHP(-1)) \underset{(-3.5)}{} - 0.002*UCH(-1) \underset{(-3.9)}{} \\
& + 9.07*dlog(A2029(-1)) \underset{(3.5)}{} + 0.10*dlog(PD(-1)) \underset{(1.6)}{} \\
& - 2.42 \underset{(-2.1)}{} - 0.26*ifeq(200803) \underset{(-4.7)}{} \\
& +0.220*(ifeq(199203) -ifeq(199204)) \underset{(5.6)}{} \\
& + 0.35*ifeq(200401) \underset{(6.3)}{} - 0.13*ifeq(200501) \underset{(-2.3)}{} \\
& + 0.159*(ifeq(200904) -ifeq(201001)) \underset{(4.1)}{}
\end{aligned}
\qquad (2.6)
$$

Unit: *000s* ***Source:*** *ONS* ***Identifier:*** *FTAQ*

where:

RHP = APH/PCE

UCH = *RMORT - 400*dlog(APH)*

Equation properties:

Estimation period: 1980Q1 to 2012Q3

Adjusted R^2 = 0.57

Static long-run solution:

log(PD)= *2.36*log(RHHDI) - 2.08*log(RHP) – 0.02*UCH – 22.61*

Elasticity of PD with respect to a 1% increase in:

	Q1	Q5	Q9	Long-run
Real household disposable income (RHHDI)	0.25%	1.02%	1.51%	2.36%
Real house prices (APH/PCE)	-0.22%	-0.89%	-1.32%	-2.05%
Housing costs (RMORT-400*dlog(APH))[4]	0.00	-0.01%	-0.01%	-0.02%

Comment: The equation for particulars delivered (housing turnover) is based on the assumption that turnover is negatively related to the difference between actual and expected house prices. Expected house prices are assumed to be determined by the user cost of housing, consumer prices and real disposable income.

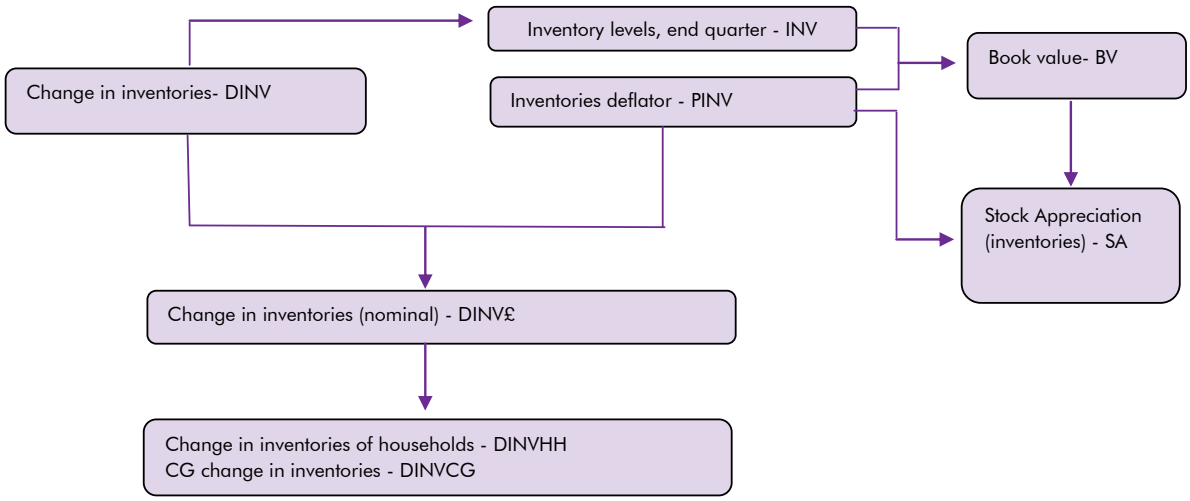
The equation also contains a demographic term, the number of people aged 20-29. This has two possible interpretations: either it enters the relation for expected house prices; or it simply represents the greater mobility of individuals in the age cohort (which need not necessarily affect expected house prices).

[4] Semi-elasticity.

Inventories

This group contains the technical relationships governing the stock cycle and stock appreciation.

Figure 2.2: Inventories



Inventory levels (INV)

Model equation: Technical relationship (identity)

$$INV = INV(-1) + DINV \quad (2.7)$$

Unit: *£m, CVM* ***Source:*** *ONS* ***Identifier:*** *N/A*

Comment: Information on end-year level of inventories previously published in the ONS' Quarterly National Accounts. Data for more recent quarters can be constructed by projecting forward the level inventories from the latest data point, using the published change in inventories.

Change in inventories (DINV)

Model equation: Imposed variable

$$DINV = DINV(-1) \quad (2.8)$$

Unit: *£m, CVM* ***Source:*** *ONS* ***Identifier:*** *CAFU*

Book value of inventories (BV)

Model equation: Technical relationship (identity)

$$BV = INV*PINV/100 \quad (2.9)$$

Unit: £m **Source:** OBR **Identifier:** N/A

Stock appreciation (SA)

Model equation: Technical relationship

$$SA = BV(-1)*(PINV/PINV(-1)-1) \quad (2.10)$$

Unit: £m **Source:** ONS **Identifier:** DLRA+EQCB

Change in inventories (nominal) (DINV£)

Model equation: Imposed variable

$$DINV£ = DINV*PINV/100 \quad (2.11)$$

Unit: £m **Source:** ONS **Identifier:** CAEX

Change in inventories – households and non-profit institutions serving households (nominal) (DINVHH)

Model equation: Technical relationship

$$DINVHH = 0.07*DINV£ \quad (2.12)$$

Unit: £m **Source:** ONS **Identifier:** RPZX

Comment: Change in inventories of households is assumed to be a fixed proportion of the change in total inventories, with the proportion set equal to the average proportion since 1987.

Change in inventories – central government (nominal) (DINVCG)

Model equation: Technical relationship

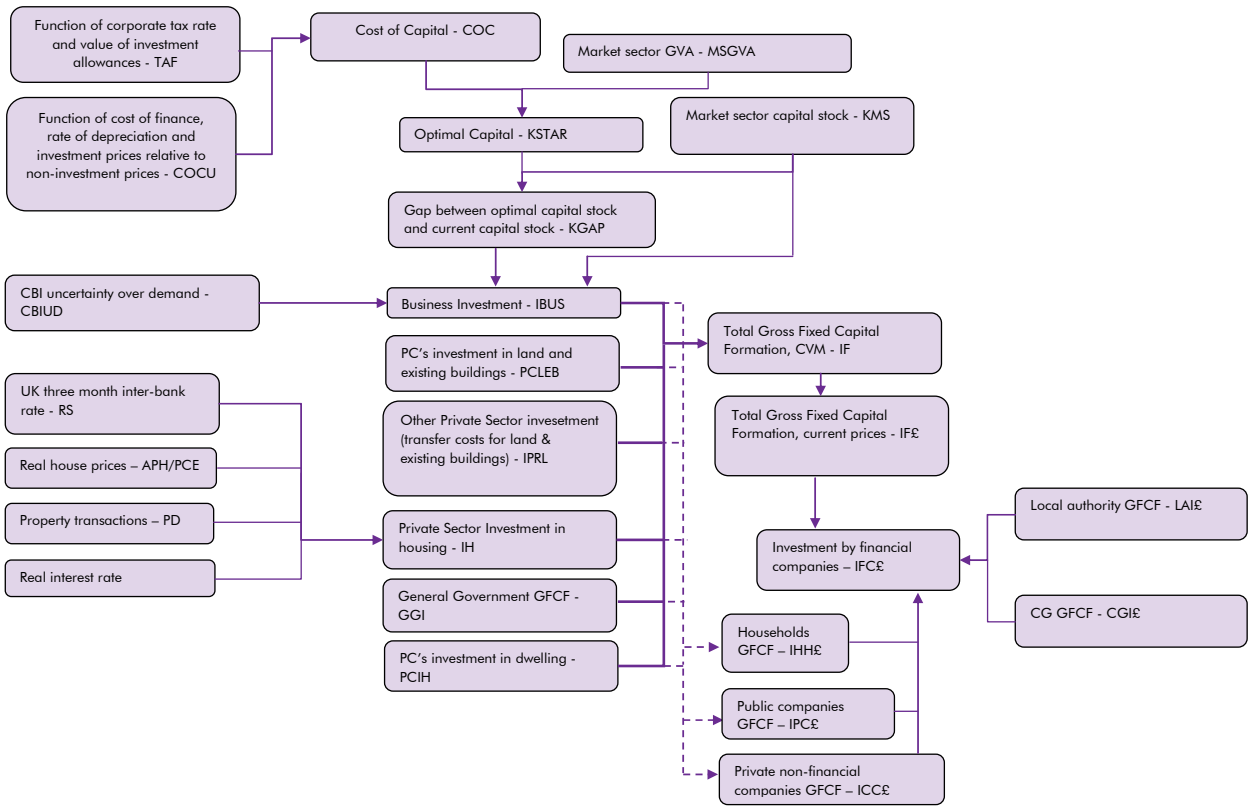
$$DINVCG = DINVCG(-1) \quad (2.13)$$

Unit: £m **Source:** ONS **Identifier:** ANMY

Investment

This group contains behavioural equations for business investment and private sector dwelling investment. The rest of the group consists of mainly identities and technical relationships. One notable change from the previous model document is an updated cost of capital series.

Figure 2.3: Investment



Taxes and allowances for cost of capital

Annual writing down allowance for industrial buildings (SIB)

Model equation: Imposed variable

$$SIB = SIB(-1) \qquad (2.14)$$

Unit: *Rate* ***Source:*** *HMRC* ***Identifier:*** *N/A*

Initial-year allowance for industrial buildings (IIB)

Model equation: Imposed variable

$$IIB = IIB(-1) \quad (2.15)$$

Unit: Rate **Source:** HMRC **Identifier:** N/A

Annual writing down allowance for plant (SP)

Model equation: Imposed variable

$$SP = SP(-1) \quad (2.16)$$

Unit: Rate **Source:** HMRC **Identifier:** N/A

First-year allowance for plant (FP)

Model equation: Imposed variable

$$FP = FP(-1) \quad (2.17)$$

Unit: Rate **Source:** HMRC **Identifier:** N/A

Annual writing down allowance for vehicles (SV)

Model equation: Imposed variable

$$SV = SV(-1) \quad (2.18)$$

Unit: Rate **Source:** HMRC **Identifier:** N/A

Discount factor for capital allowances (DISCO)

Model equation: Imposed variable

$$DISCO = DISCO(-1) \quad (2.19)$$

Unit: Per cent **Source:** OBR **Identifier:** N/A

Comment: Capital allowances are discounted using a constant 7 per cent discount rate. This is the long-run average value of the cost of finance.

Present value of depreciation allowances for buildings (DB)

Model equation: Technical relationship

$$DB = Ifle(201101)*1/(1 + DISCO)*(IIB + (SIB/DISCO)*(1 - (1+DISCO) \hat{} ((-1)*(1 - IIB)/(SIB + 0.1*ifge(201102)))))) \quad (2.20)$$

Unit: - *Source:* OBR *Identifier:* N/A

Present value of depreciation allowances for plants (DP)

Model equation: Technical relationship

$$DP = 1/(1+DISCO)*((DISCO*FP+SP)/(DISCO+SP)) \quad (2.21)$$

Unit: - *Source:* OBR *Identifier:* N/A

Present value of depreciation allowances for vehicles (DV)

Model equation: Technical relationship

$$DV = 1/(1+DISCO)*SV/(DISCO+SV) \quad (2.22)$$

Unit: - *Source:* OBR *Identifier:* N/A

Tax adjustment factors

Tax adjustment factor for buildings (TAFB)

Model equation: Technical relationship

$$TAFB = (1-TCPRO*DB)/(1-TCPRO) \quad (2.23)$$

Unit: - *Source:* OBR *Identifier:* N/A

Tax adjustment factor for plant (TAFP)

Model equation: Technical relationship

$$TAFP = (1-TCPRO*DP)/(1-TCPRO) \quad (2.24)$$

Unit: - *Source:* OBR *Identifier:* N/A

Tax adjustment factor for vehicles (TAFV)

Model equation: Technical relationship

$$TAFV = (1-TCPRO*DV)/(1-TCPRO) \quad (2.25)$$

Unit: - **Source:** OBR **Identifier:** N/A

Tax adjustment factor for private sector (TAF)

Model equation: Technical relationship

$$TAF = WB*TAFB+WP*TAFP+WV*TAFV \quad (2.26)$$

where:

$WB =$	0.31	*Investment share buildings*
$WP=$	0.54	*Investment share plant*
$WV=$	0.14	*Investment share vehicles*

Unit: - **Source:** ONS, OBR **Identifier:** N/A

Comment: For each asset the tax adjustment factor is calculated using the present value of any capital allowances and the corporation tax rate. The tax adjustment factor for all assets is the sum of individual tax adjustment factors for buildings, plant/machinery and vehicles weighted by the assets' share of investment. Weights are based on long-run averages. The condition implies the tax-adjustment factor, and therefore the cost of capital, falls following a cut in the corporation tax rate or an increase in capital allowances.

Calculation of cost of finance

Weight on debt finance (DEBTW)

Model equation: Imposed variable

$$DEBTW = DEBTW(-1) \quad (2.27)$$

Unit: - **Source:** ONS **Identifier:** (NNZF+NNZO-NOOG+NOME-NOPI+NONQ-NOQU)/(NNZF+NNZO-NOOG+NOME-NOPI+NONQ-NOQU+NOMW-NOQA)

Dividend yield of UK non-financials (NDIV)

Model equation: Imposed variable

$$NDIV = NDIV(-1) \quad (2.28)$$

Unit: - **Source:** ONS **Identifier:** A5GA

Comment: The series for non-financial dividend yield (A5GA) was discontinued in 2011. The series is extended forward using the series dividend payments (NETZ) and total shares and other equity (NLBU) of private non-financial corporations.

Cost of debt finance (CDEBT)

Model equation: Imposed variable

$$CDEBT = CDEBT(-1) + diff(RIC) \quad (2.29)$$

Unit: *Percentage points* ***Source:*** *OBR* ***Identifier:*** *N/A*

Comment: The cost of debt finance (CDEBT) is calculated as the sum of a risk free rate, taken as the 10-year gilt rate, and the spread on non-financial BBB rated corporate debt. However, as the spread of non-financial BBB rated corporate debt is not included in the model the series is projected forward over the forecast period using the change in the effective rate on bank lending to private non-financial corporations.

Cost of equity finance (CEQUITY)

Model equation: Technical relationship

$$CEQUITY = NDIV*(1+WG)+100*WG \quad (2.30)$$

Unit: *Percentage points* ***Source:*** *OBR* ***Identifier:*** *N/A*

where:

$$WG = 0.03$$

Comment: The cost of equity finance (CEQUITY) is calculated using a simple dividend discount model. Dividend growth (WG) of 3 per cent per annum is assumed.

Real weighted average cost of finance (RWACC)

Model equation: Technical relationship

$$RWACC = DEBTW*CDEBT+(1-DEBTW)*CEQUITY \quad (2.31)$$

Unit: *-* ***Source:*** *OBR* ***Identifier:*** *N/A*

Cost of capital

Rate of depreciation (DELTA)

Model equation: Imposed variable

$$DELTA = DELTA(-1) \quad (2.32)$$

Unit: - *Source:* OBR *Identifier:* N/A

Comment: The rate of depreciation is assumed to be constant at 8 per cent per annum, the standard assumption made in the investment literature.

Unadjusted real cost of capital (COCU)

Model equation: Technical relationship

$$COCU = PIBUS/PGDP*obs(PGDP,197001)/obs(PIBUS,197001)*(DELTA*RWACC) \quad (2.33)$$

Unit: - *Source:* OBR *Identifier:* N/A

Comment: In theory the unadjusted cost of capital should also include a term for expected inflation, but as this is unobservable it is excluded from the calculation.

Tax-adjusted real cost of capital (COC)

Model equation: Technical relationship

$$COC = TAF*COCU \quad (2.34)$$

Unit: - *Source:* OBR *Identifier:* N/A

Comment: As the tax-adjustment factor is just a scalar, the adjusted and unadjusted cost of capital series follow each other closely.

Business investment

Optimal capital (KSTAR)

Model equation: Technical relationship

$$KSTAR = Exp(log(MSGVA)-0.4*log(COC)+2.59) \quad (2.35)$$

Unit: - *Source:* OBR *Identifier:* N/A

Comment: The amount of capital stock a firm wishes to hold is based on the level of output and the cost of capital. This is based on the on the first order condition of a profit maximising firm. The elasticity of substitution between factors is assumed to be 0.4. The constant 2.59 scales 'optimal' capital stock (KSTAR) to actual capital stock (KMS) in 2006.

Gap between capital stock and optimal level of (KGAP)

Model equation: Technical relationship

$$KGAP = log(KMS*1000)-log(KSTAR) \quad (2.36)$$

Unit: - **Source:** OBR **Identifier:** N/A

Business investment (IBUS)

Model equation: Technical relationship

$$IBUS = IBUSX+17394*ifge(200502) \quad (2.37)$$

Unit: £m, CVM **Source:** ONS **Identifier:** NPEL

Business investment excluding BNFL transfer to CG (IBUSX)

Model equation: Behavioural variable

$$\begin{aligned} IBUSX = {} & \underset{(1.8)}{0.14}*dlog(IBUSX(-3)) + \underset{(2.0)}{0.16}*dlog(IBUSX(-4)) + \\ & \underset{(2.9)}{1.04}*dlog(MSGVA(-1)) - \underset{(-2.1)}{0.001}*CBIUD \\ & - \underset{(-2.4)}{0.08}*(log(IBUSX(-1)) - log(KMS(-2)*1000) \\ & + KGAP(-2)) + \underset{(2.6)}{0.05}*(ifeq(201004)-ifeq(201101)) \\ & - \underset{(-5.4)}{0.11}*(ifeq(198501)-ifeq(198502)) - \underset{(2.0)}{0.26} \end{aligned} \quad (2.38)$$

Unit: £m, CVM **Source:** ONS **Identifier:** GAN8

Equation properties

Estimation period: 1982Q1 to 2011Q1.

Adjusted $R^2 = 0.39$

Static long-run solution:

$$log\ IBUSX = log\ MSGVA - 0.4*log\ COC + constant$$

Elasticity of IBUSX with respect to a 1% increase in:

	Q1	Q5	Q9	Long-run
Market sector GVA (MSGVA)	1.04%	1.33%	1.32%	1.00%
Cost of capital (COC)	0.00%	-0.12%	-0.23%	-0.40%

Comment: The IBUSX business investment series excludes the transfer of nuclear reactors nearing the end of their productive lives from the British Nuclear Fuels plc to the Nuclear Decommissioning Authority. This transfer increased business investment in the second quarter of 2005 and reduced general government investment (GGI).

The business investment equation is an error correction model which uses two long-run relationships. The first is a relationship between the capital stock (KMS - market sector capital stock) and its determinants; output (MSGVA – market sector GVA) and the cost of capital (COC). This is based on the first order condition of a profit maximising firm and is imposed in line with micro-econometric data. This is in contrast to the previous model equation for business investment which is based on a cost minimisation approach. The second relationship is the steady state of the capital accumulation identity; which suggests the ratio of business investment (IBUS) to the capital stock should be constant in the long run.

The equation also includes short run dynamics to improve the fit. Two dummy variables are included; one for a spike in business investment in 1985Q1 due to pre-announced changes in tax allowances and a second in 2010Q4 for a spike in business investment following a change in the VAT treatment of aircraft. The coefficient on KGAP was estimated to be very close to 1. It has been imposed to be exactly equal to 1, implying adjustment to a new equilibrium occurs equally through the IBUS-to-KMS ratio and KGAP.

CBI factors reducing investment –uncertainty over demand (CBIUD)

Model equation: Behavioural variable

$$CBIUD = \underset{(-3.6)}{-169.01}*dlog(MSGVA(-1)) + \underset{(5.5)}{0.49}*CBIUD(-1) + \underset{(2.7)}{0.23}*CBIUD(-2) + \underset{(4.6)}{14.94} \quad (2.39)$$

Unit: *Balance* ***Source:*** *CBI* ***Identifier:*** *N/A*

Comment: The CBI industrial trends survey includes a question on what factors are likely to limit investment over the next 12 months. One of the options is uncertainty about demand. The responses to the questions are turned into a balance. The balance is extended forward using a simple equation based on the previous balance level and market sector GVA growth.

Other investment in constant prices

General Government GFCF (GGI£)

Model equation: Technical relationship

$$GGI£ = CGI£ + LAI£ \quad (2.40)$$

Unit: £m **Source:** ONS **Identifier:** RPZG

General Government gross fixed capital formation (GGI)

Model equation: Technical relationship

$$GGI = 100*GGI£/GGIDEF \quad (2.41)$$

Unit: £m, CVM **Source:** ONS **Identifier:** DLWF

General Government GFCF including BNFL transfer to CG (GGIX)

Model equation: Technical relationship

$$GGIX = GGI + 17394*ifeq(200502) \quad (2.42)$$

Unit: £m, CVM **Source:** ONS **Identifier:** N/A

Comment: The GGIX series excludes the transfer of nuclear reactors nearing the end of their productive lives from the British Nuclear Fuels plc to the Nuclear Decommissioning Authority. The negative value of the transfer reflects the large decommissioning and clean-up liabilities.

Private sector investment in dwellings (IH)

Model equation: Behavioural variable

$$dlog(IH) = \underset{(-4.0)}{-0.26}*log(IH)(-1)) + \underset{(1.0)}{0.02}*log(APH)(-1)/PCE(-1)) - \underset{(-1.8)}{0.001}*(RS(-1) - 400*dlog(APH(-1))) \quad (2.43)$$

$$+ 0.08*log(PD(-1)*0.85) - 0.14*dlog(IH(-1))$$
$$(1.9) \qquad (-1.6)$$
$$+ 2.07$$
$$(3.8)$$

Unit: *£m, CVM* ***Source:*** *ONS* ***Identifier:*** *L636*

Equation properties

Estimation period: 1978Q1 to 2012Q3.

Adjusted $R^2 = 0.16$

Static long-run solution:

$$log\ IH = 0.08*log(APH/PCE) - 0.005*(RS - 400*dlog(APH)) + 0.29*log\ PD + constant$$

Elasticity of IH with respect to a 1% increase in:

	Q1	Q5	Q9	Long-run
Real interest rate* (RS - 400*dlog(APH))	-0.002%	-0.004%	-0.005%	-0.005%
Real house prices (APH/PCE)	0.02%	0.06%	0.07%	0.08%
Property transactions (PD)	0.08%	0.21%	0.26%	0.29%

*Semi elasticity

Comment: Private sector dwelling investment covers both investment in new dwellings and home improvements. Private sector dwelling investment is modelled using a long-term relationship with housing transactions (as a proxy for the demand for housing), and real house prices and real interest rates (proxies for the profitability of house building). The equation was estimated using a housing transactions series excluding transactions of new builds, to reduce endogeneity problems. The number of property transactions has been scaled to reflect this in the model code, rather than including and forecasting the adjusted property transaction series. A lag of the growth in dwelling investment is also included in the equation to improve model fit.

Public Corporation investment in dwellings (PCIH)

Model equation: Technical relationship

$$ratio(PCIH) = ratio(IH) \quad (2.44)$$

Unit: £m, CVM **Source:** ONS **Identifier:** L634

Net acquisition of valuables (VAL)

Model equation: Imposed variable

$$VAL = VAL(-1) \quad (2.45)$$

Unit: £m, CVM **Source:** ONS **Identifier:** NPJR

HH net acquisition of valuables (VALHH)

Model equation: Technical relationship

$$VALHH = 0.25*VAL£ \quad (2.46)$$

Unit: £m, CVM **Source:** ONS **Identifier:** RPZY

PC investment in existing buildings and transfer costs (PCLEB)

Model equation: Imposed variable

$$PCLEB = PCLEB(-1) \quad (2.47)$$

Unit: £m, CVM **Source:** ONS **Identifier:** L635

Private sector investment in existing buildings (IPRL)

Model equation: Imposed variable

$$IPRL = IPRL(-1) \quad (2.48)$$

Unit: £m, CVM **Source:** ONS **Identifier:** L637

Total gross fixed capital formation (IF)

Model equation: Technical relationship (identity)

$$IF = IBUS+GGI+PCIH+PCLEB+IH+IPRL \quad (2.49)$$

Unit: £m, CVM **Source:** ONS **Identifier:** NPQT

Investment in current prices

Total gross fixed capital formation (IF£)

Model equation: Technical relationship (identity)

$$IF£ = IF*PIF/100 \quad (2.50)$$

Unit: £m **Source:** ONS **Identifier:** NPQS

General Government investment deflator (GGIDEF)

Model equation: Technical relationship

$$ratio(GGIDEF) = ratio(PIF) \quad (2.51)$$

Unit: - **Source:** ONS **Identifier:** 100*(RPZG/DLWF)

HH net acquisitions of non-produced non-fin assets (NPAHH)

Model equation: Imposed variable

$$NPAHH = NPAHH(-1) \quad (2.52)$$

Uit: £m **Source:** ONS **Identifier:** RPZU

Gross fixed capital formation by HH and NPISH (IHH£)

Model equation: Technical relationship

$$IHH£ = 0.97*(PIH/100)*IH+0.53*(PIPRL/100)*IPRL +0.08* (PIBUS/100)*IBUS \quad (2.53)$$

where:

$$PIH = APH*0.58$$
$$PIPRL = APH*0.65$$
$$PIPC = PIF*0.98$$

Unit: £m **Source:** ONS **Identifier:** RPZW

Business investment deflator (PIBUS)

Model equation: Technical relationship

$$PIBUS = 100*(IF£ - (PIH/100)*IH - (PIPRL/100)*IPRL - (PIPC/100)*(PCIH+PCLEB) - GGI£)/IBUS \quad (2.54)$$

Unit: - **Source:** ONS **Identifier:** N/A

Gross fixed capital formation by PNFCs (ICC£)

Model equation: Technical relationship

$$ICC£ = 0.03*(PIH/100)*IH + 0.23*(PIPRL/100)*IPRL + 0.82* (PIBUS/100)*IBUS \quad (2.55)$$

Unit: £m **Source:** ONS **Identifier:** ROAW

GFCF and net acquisition of land: PCs (IPC£)

Model equation: Technical relationship

$$IPC£ = (PIPC/100)*(PIH + PCLEB) + 0.04*(PIBUS/100)*IBUS \quad (2.56)$$

Unit: £m **Source:** ONS **Identifier:** ANNQ

Gross fixed capital formation by FINCOs (IFC£)

Model equation: Technical relationship (identity)

$$IFC£ = IF£ - IHH£ - ICC£ - LAI£ - CGI£ - IPC£ \quad (2.57)$$

Unit: £m **Source:** ONS **Identifier:** RPYQ

Net acquisition of valuables (VAL£)

Model equation: Technical relationship

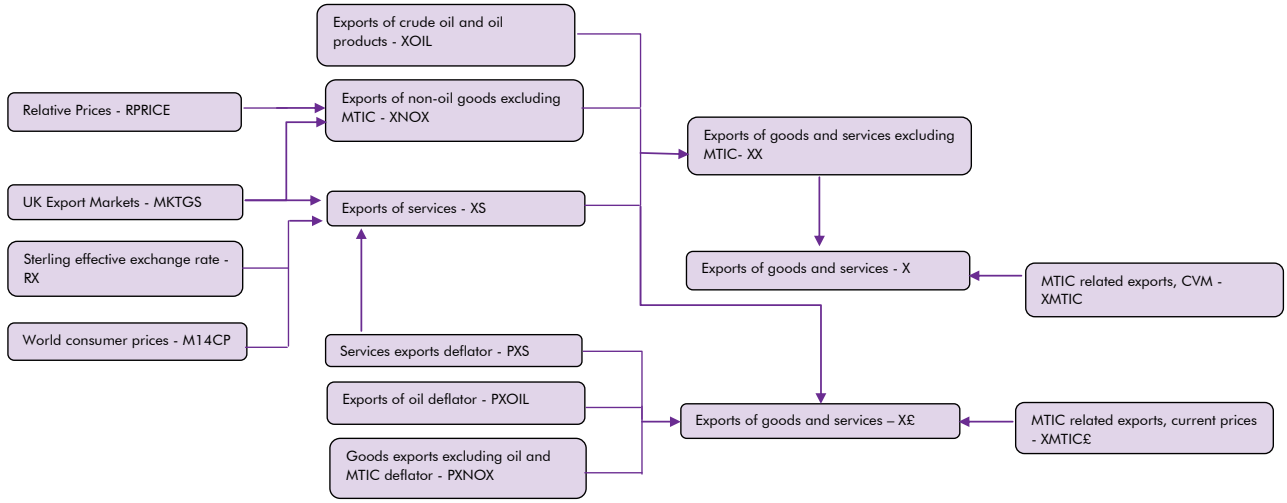
$$VAL£ = VAL*PIF/100 \quad (2.58)$$

Unit: £m **Source:** ONS **Identifier:** NPJQ

Exports

This group contains equations for exports of non-oil goods and exports of services. It also includes identities for total export volumes and values and world economy variables.

Figure 2.4: Exports of goods and services



Goods exports

MTIC fraud related exports, constant prices (XMTIC)

Model equation: Imposed variable

$$XMTIC = XMTIC(-1) \qquad (2.59)$$

Unit: *£m, CVM* ***Source:*** *ONS* ***Identifier:*** *BQKQ-BQHR*

MTIC fraud related exports, current prices (XMTIC£)

Model equation: Imposed variable

$$XMTIC£ = XMTIC£(-1) \qquad (2.60)$$

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *IKBH-IKBB-BQHP*

Exports of non-oil goods excluding MTIC, constant prices (XNOX)

Model equation: Behavioural variable

$$dlog(XNOX) = \underset{(4.0)}{0.64}*dlog(MKTGS) - \underset{(-2.8)}{0.24}*dlog(XNOX(-1)) - \underset{(-3.2)}{0.24}*dlog(RPRICE(-1)) + \underset{(1.9)}{0.03}*(ifeq(200602) - ifeq(200603)) - \underset{(-2.4)}{0.07}*(log(XNOX(-1)) - log(MKTGS(-1)) + 0.74*log(RPRICE(-1))) + \underset{(2.4)}{0.62} \quad (2.61)$$

Unit: *£m, CVM* ***Source:*** *ONS* ***Identifier:*** *BQHR-BOXX*

Equation properties

Estimation period: 1980Q1 to 2006Q4.

Adjusted $R^2 = 0.25$

Static long-run solution:

$$log\ XNOX = log\ MKTGS - 0.74*log\ RPRICE + constant$$

Elasticity of XNOX with respect to a 1% increase in:

	Q1	Q5	Q9	Long-run
Relative export prices (RPRICE)	-0.29%	-0.33%	-0.41%	-0.74%
UK export markets (MKTGS)	0.51%	0.63%	0.70%	1.00%

Comment: This equation assumes that in the long-run the level of UK goods exports is determined by the size of UK export markets and the price of UK goods exports relative to prices in other economies. The long-run coefficient on the size of UK export markets is consistent with the level of UK goods exports increasing one-for-one with the level of our main export markets. We use an instrumental variable approach to impose the coefficient on RPRICE, after finding evidence that the coefficient from an OLS estimation approach is biased. The equation also includes short-run dynamics.

Relative export prices (RPRICE)

Model equation: Imposed variable

$$RPRICE = RPRICE(-1) \qquad (2.62)$$

Unit: Index **Source:** ONS **Identifier:** CTPC

Comment: This variable measures the price of UK goods exports relative to prices in other countries. The ONS stopped producing the series CTPC in 2001; after 2001 we use the variable world price of goods (WPG) to extend the series.

Services exports

Exports of services, constant prices (XS)

Model equation: Behavioural variable

$$\begin{aligned} dlog(XS) = {} & \underset{(3.2)}{0.41}*dlog(MKTGS(-1)) - \underset{(-4.0)}{0.32}*dlog(XS(-1)) \\ & + \underset{(2.8)}{0.13}*dlog(OTLROW(-4)) \\ & - \underset{(-3.1)}{0.04}*(ifeq(200103) - ifeq(200104)) \\ & - \underset{(-3.6)}{0.08}*(ifeq(199101)) - \underset{(-3.1)}{0.09}*(log(XS(-1)) \\ & + \underset{(2.3)}{0.47}*log(PXS(-1)*RXD(-1)/MAJCP(-1)) \\ & - log(MKTGS(-1))) + \underset{(3.1)}{0.50} \end{aligned} \qquad (2.63)$$

Unit: £m, CVM **Source:** ONS **Identifier:** IKBE

Equation properties

Estimation period: 1984Q1 to 2010Q4.

Adjusted $R^2 = 0.36$

Static long-run solution:

$$log\ XS = log\ MKTGS - 0.47*\log(PXS*RXD/MAJCP) + constant$$

Elasticity of XS with respect to a 1% increase in:

	Q1	Q5	Q9	Long-run
Relative Prices (PXS*RXD/MAJCP)	-0.04%	-0.14%	-0.22%	-0.47%
UK export markets (MKTGS)	0.50%	0.53%	0.64%	1.00%

Comment: This equation assumes that in the long-run the level of UK services exports is determined by the size of UK export markets and a measure of price competitiveness. The coefficient on UK export markets is consistent with the level of UK service exports increasing one-for-one with the level of our main export markets. The equation also includes short-run dynamics.

Total exports

Total exports excluding MTIC, constant prices (XX)

Model equation: Technical relationship (identity)

$$XX = XNOX + XS + XOIL \quad (2.64)$$

Unit: £m, CVM **Source:** ONS **Identifier:** BQHR+IKBE

Total exports, constant prices (X)

Model equation: Technical relationship (identity)

$$X = XNOX + XS + XOIL + XMTIC \quad (2.65)$$

Unit: £m, CVM **Source:** ONS **Identifier:** IKBK

Total exports, current prices (X£)

Model equation: Technical relationship (identity)

$$X£ = (PXNOX/100)*XNOX + (PXS/100)*XS + (PXOIL/100)*XOIL + XMTIC£ \quad (2.66)$$

Unit: £m **Source:** ONS **Identifier:** IKBH

World economy variables

Consumer prices in the US, Canada, Japan and the euro area (M20CP)

Model equation: Imposed variable

$$M20CP = M20CP(-1) \quad (2.67)$$

Unit: *Index* ***Source:*** *OECD, ECB, OBR* ***Identifier:*** *N/A*

Comment: Index of consumer prices for the euro area, US, Canada and Japan weighted by output share.

GDP in the US, Canada, Japan and the euro area (M20GDP)

Model equation: Imposed variable

$$M20GDP = M20GDP(-1) \quad (2.68)$$

Unit: *Index* ***Source:*** *Various, OBR* ***Identifier:*** *N/A*

Comment: Index of GDP for the euro area, US, Canada and Japan weighted by output share.

UK export markets for goods and services (MKTGS)

Model equation: Imposed variable

$$MKTGS = MKTGS(-1) \quad (2.69)$$

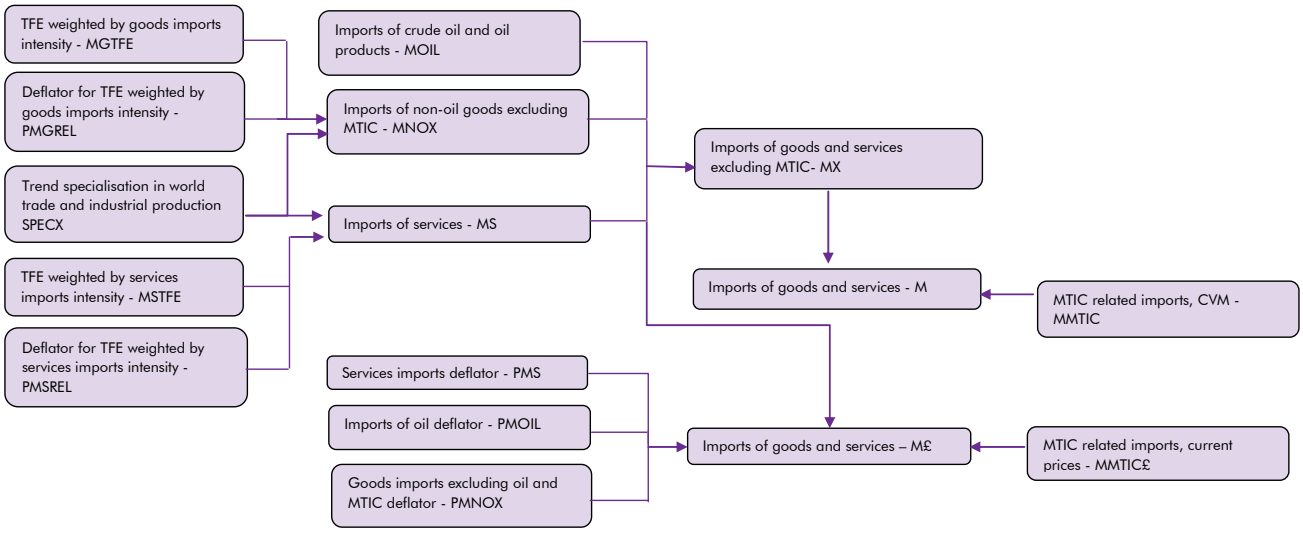
Unit: *Index* ***Source:*** *OECD, OBR* ***Identifier:*** *N/A*

Comment: MKTGS is the import growth of the UK's trading partners weighted by each country's importance for UK exports. The imports data are from the OECD and the weights are from ONS data on UK exports by country.

Imports

This group contains behavioural equations for imports of non-oil goods and imports of services. It also includes identities for total import volumes and values.

Figure 2.5: Imports of goods and services



Goods imports

MTIC fraud related imports, constant prices (MMTIC)

Model equation: Imposed variable

$$MMTIC = XMTIC \qquad (2.70)$$

Unit: *£m, CVM* ***Source:*** *ONS* ***Identifier:*** *BQKO-BQHS*

MTIC fraud related imports, current prices (MMTIC£)

Model equation: Imposed variable

$$MMTIC£ = XMTIC£ \qquad (2.71)$$

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *IKBI-IKBC-BQHQ*

Imports of non-oil goods excluding MTIC, constant prices (MNOX)

Model equation: Behavioural variable

$$dlog(MNOX) = \underset{(11.8)}{1.44}*dlog(MGTFE) \quad (2.72)$$
$$- \underset{(-3.4)}{0.11}*(log(MNOX(-1)) - log(MGTFE(-1))$$
$$+ \underset{(1.0)}{0.32}*log(PMGREL(-1)) - \underset{(-6.3)}{0.52}*log(SPECX(-1)))$$
$$- \underset{(-3.0)}{0.06}$$

Unit: *£m, CVM* ***Source:*** *ONS* ***Identifier:*** *BQHS-BPIX*

Equation properties:

Estimation period: 1980Q1 to 2010Q4.

Adjusted $R^2 = 0.52$

Static long-run solution:

$$log(MNOX) = log\ MGTFE - 0.32*\text{log PMGREL} + 0.52*\text{log SPECX} + constant$$

Elasticity of MNOX with respect to a 1% increase in:

	Q1	Q5	Q9	Long-run
Weighted TFE (MGTFE)	1.39%	1.25%	1.16%	1.00%
Relative Prices (PMGREL)	-0.03%	-0.14%	-0.20%	-0.32%
Trend Specialisation (SPECX)	0.06%	0.22%	0.33%	0.52%

Comment: The goods imports equation assumes a long-run relationship between the level of goods imports, relative prices and import weighted total final expenditure. We restrict the long-run coefficient on the total final expenditure variable to one. The long-run coefficient on the relative price term is much lower than in the other goods and services trade equations, suggesting that the demand for goods imports is not very sensitive to prices. The equation also includes a world trade specialisation term and short-run dynamics.

Index of total final expenditure weighted by goods import intensity (MGTFE)

Model equation: Technical relationship

$$MGTFE = 0.15*C + 0.08*CGG + 0.24*IF + 0.41*DINV + 0.31*XNOX + 0.06*XS \quad (2.73)$$

Unit: Index **Source:** ONS, OBR **Identifier:** N/A

Comment: Some components of total final expenditure are more import intensive than others. For example, goods are more import intensive than government spending. This means the UK's demand for goods imports depends on both the level of total final expenditure and its composition. To try and capture this we include a total final expenditure variable weighted by goods import intensity. The weights are derived from the ONS Supply-Use tables.

Deflator for total final expenditure weighted by goods import intensity (PMGREL)

Model equation: Technical relationship

$$PMGREL = PMNOX/(0.15*PCE + 0.08*GGFCD + 0.24*PIF + 0.41*PINV + 0.31*PXNOX + 0.06*PXS) \quad (2.74)$$

Unit: Index **Source:** ONS, OBR **Identifier:** N/A

Services imports

Imports of services, constant prices (MS)

Model equation: Behavioural variable

$$\begin{aligned} dlog(MS) = {} & \underset{(5.1)}{1.34}*dlog(MSTFE) - \underset{(-4.1)}{0.473}*dlog(PMSREL) \\ & - \underset{(-2.0)}{0.16}*dlog(MS(-1)) - \underset{(-2.3)}{0.06}*(ifeq(199101)) \\ & - \underset{(-2.9)}{0.18}*(log(MS(-1)) - log(MSTFE(-1)) \\ & - \underset{(16.3)}{0.67}*log(SPECX(-1)) + \underset{(3.2)}{1.11}*log(PMSREL(-1))) \\ & + \underset{(2.1)}{0.15} \end{aligned} \quad (2.75)$$

Unit: £m, CVM **Source:** ONS **Identifier:** IKBF

Equation properties

Estimation period: 1980Q1 to 2010Q4.

Adjusted $R^2 = 0.32$

Static long-run solution:

log MS = *log MSTFE* – 1.11*log PMSREL + 0.67*log SPECX + *constant*

Elasticity of MS with respect to a 1% increase in:

	Q1	Q5	Q9	Long-run
Weighted TFE (MSTFE)	1.07%	1.06%	1.03%	1.00%
Relative Prices (PMSREL)	-0.51%	-0.80%	-0.95%	-1.11%
Trend Specialisation (SPECX)	0.12%	0.38%	0.52%	0.67%

Comment: This equation assumes that in the long-run the level of UK service imports depends on the level of weighted total final expenditure and relative prices. We have restricted the long-run coefficient on the weighted TFE variable to one and included a world trade specialisation term consistent with the goods imports equation. The equation also includes some short-run dynamics.

Index of total final expenditure weighted by services import intensity (MSTFE)

Model equation: Technical relationship

MSTFE = *0.06*C + 0.03*CGG + 0.05*IF + 0.05*DINV + 0.03*XNOX + 0.09*XS* (2.76)

Unit: *Index* ***Source:*** *ONS, OBR* ***Identifier:*** *N/A*

Comment: The UK's demand for services imports depends on both the level of total final expenditure and its composition. To try and capture this we include a total final expenditure variable weighted by services import intensity. The weights are derived from the ONS Supply-Use tables.

Deflator for total final expenditure weighted by services import intensity (PMSREL)

Model equation: Technical relationship

$$PMSREL = PMS/(0.06*PCE + 0.03*GGFCD + 0.05*PIF + 0.06*PINV + 0.03*PXNOX + 0.09*PXS) \quad (2.77)$$

Unit: *Index* ***Source:*** *ONS, OBR* ***Identifier:*** *N/A*

Total imports and trade balance

Total imports excluding MTIC, constant prices (MX)

Model equation: Technical relationship (identity)

$$MX = MNOX + MS + MOIL \quad (2.78)$$

Unit: *£m, CVM* ***Source:*** *ONS* ***Identifier:*** *BQHS+IKBF*

Total imports, constant prices (M)

Model equation: Technical relationship (identity)

$$M = MNOX + MS + MOIL + MMTIC \quad (2.79)$$

Unit: *£m, CVM* ***Source:*** *ONS* ***Identifier:*** *IKBL*

Total imports, current prices (M£)

Model equation: Technical relationship (identity)

$$M£ = (PMNOX/100)*MNOX + (PMS/100)* MS + (PMOIL/100)*MOIL + MMTIC£ \quad (2.80)$$

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *IKBI*

World variables

Trend specialisation in world trade and industrial production (SPECX)

Model equation: Imposed variable

$$SPECX = SPECX(-1) \quad (2.81)$$

Unit: *Index* ***Source:*** *OECD, OBR* ***Identifier:*** *N/A*

Comment: There has been a noticeable rise in import intensities, particularly for goods imports, over time. This is likely to reflect the general worldwide trend of greater economic integration. This variable tries to capture the trend specialisation in world production and is defined as an eight quarter moving average of the ratio of world trade to industrial production.

Public sector expenditure

This group contains the public sector expenditure side of the National Accounts, including central government and local authority expenditure on wages and salaries, procurement, capital formation and subsidies and grants.

A large number of variables in this group are labelled as 'imposed' variables as they are determined outside of the macroeconomic model. For example, public sector current and capital spending forecasts are compiled using the spending control framework, consisting of Department Expenditure Limits (DELs) and Annually Managed Expenditure (AME). Forecasts of these aggregates determine the general government components of the income and expenditure measures of Gross Domestic Product, and are complied outside of the macroeconomic model[5]. For more details of the OBR's approach to forecasting the public finances, see OBR, 2011, *Forecasting the public finances*.

Central government compensation of employees (CGWS)

Model equation: Technical relationship

$$CGWS = CGWADJ*ERCG*ECG*(52/4000)*(1+(1.25*EMPSC/WFP)) \quad (2.82)$$

Unit: £m ***Source:*** ONS ***Identifier:*** QWPS

Local authority compensation of employees (LAWS)

Model equation: Technical relationship

$$LAWS = LAWADJ*ERLA*ELA*(52/4000)*(1+(1.42*EMPSC/WFP)) \quad (2.83)$$

Unit: £m ***Source:*** ONS ***Identifier:*** QWRY

[5] Some elements of these totals are endogenous to the economic forecast – for example, social security elements of Annually Managed Expenditure are partly determined by the forecast for claimant count unemployment. While based on the OBR's economic forecast, forecasts of these elements of AME are compiled using separate forecasting models maintained and run by the Department for Work and Pensions, and are thus labelled as imposed.

Central government procurement expenditure (CGP)

Model equation: Imposed variable

$$CGP = CGP(-1) \quad (2.84)$$

Unit: £m **Source:** ONS **Identifier:** QWPT

Local authority procurement expenditure (LAPR)

Model equation: Imposed variable

$$LAPR = LAPR(-1) \quad (2.85)$$

Unit: £m **Source:** ONS **Identifier:** QWPT

Central government gross fixed capital formation (CGI£)

Model equation: Imposed variable

$$CGI£ = CGI£(-1) \quad (2.86)$$

Unit: £m **Source:** ONS **Identifier:** NMES

Local authority gross fixed capital formation (LAI£)

Model equation: Imposed variable

$$LAI£ = LAI£(-1) \quad (2.87)$$

Unit: £m **Source:** ONS **Identifier:** NMOA

Central government non-trading capital consumption (RCGIM)

Model equation: Imposed variable

$$RCGIM = RCGIM(-1) \quad (2.88)$$

Unit: £m **Source:** ONS **Identifier:** NSRN

Local authority non-trading capital consumption (RLAIM)

Model equation: Imposed variable

$$RLAIM = RLAIM(-1) \quad (2.89)$$

Unit: £m **Source:** ONS **Identifier:** NSRO

General government gross operating surplus (OSGG)

Model equation: Technical relationship (identity)

$$OSGG = RCGIM + RLAIM + 100 \quad (2.90)$$

Unit: £m **Source:** ONS **Identifier:** NMXV

General government final consumption (nominal) (CGG£PSF, CGG£)

Model equation: Imposed variable

$$CGG£PSF = CGWS + LAWS + CGP + LAPR + RCGIM + RLAIM \quad (2.91)$$

Unit: £m **Source:** ONS **Identifier:** NMRP

Model equation: Imposed variable

$$CGG£ = CGWS + LAWS + CGP + LAPR + RCGIM + RLAIM \quad (2.92)$$

Unit: £m **Source:** ONS **Identifier:** NMRP

Comment: Recent estimates of government consumption as measured in the National Accounts can often depart from that implied by the latest Public Sector Finance statistics, reflecting differences in revisions practices. In particular, Public Sector Finance statistics operate on the basis of an open revisions policy, with classification changes introduced at the earliest possible opportunity. By contrast the National Accounts operate an annual revisions policy, which controls the number of revisions. In practice this can mean that classification decisions taken

after a certain point in the year may be incorporated into the Public Sector Finance statistics before they are reflected in the National Accounts.[6] The variables CGG£PSF and CGG£ correspond, respectively, to the series consistent with the latest Public Sector Finance statistics and the series consistent with the latest National Accounts data.

General government final consumption deflator (GGFCD)

Model equation: Imposed variable

GGFCD= *GGFCD(-1)* *(2.93)*

Unit: ***Source:*** *ONS* ***Identifier:*** *100*NMRP/NMRY*

Comment: Over two thirds of real government consumption is measured directly, using indicators of activity such as the number of prescriptions, school pupils and court cases. The remaining one-third is indirectly derived by deflating an estimate of nominal spending by a relevant price index. Accordingly, the growth rate of the government consumption deflator can exhibit significant change if changes in expenditure are not matched by changes in directly measured activity.[7]

General government consumption (real) (CGG)

Model equation: Technical relationship (identity)

CGG = *CGG£/(GGFCD/100)* *(2.94)*

Unit: *£m, CVM* ***Source:*** *ONS* ***Identifier:*** *NMRY*

[6] For more details, see ONS, *Improving Government statistics – Aligning the Public Sector Finances and National Accounts and other developments to public sector statistics.*

[7] See Box 3.6 of the December 2012 *Economic and Fiscal Outlook*.

Central government subsidies on products (CGSUBP)

Model equation: Imposed variable

$$CGSUBP = CGSUBP(-1) \quad (2.95)$$

Unit: £m ***Source:*** ONS ***Identifier:*** NMCB

Payable company tax credits (PCOTC)

Model equation: Imposed variable

$$PCOTC = PCOTC(-1) \quad (2.96)$$

Unit: £m ***Source:*** ONS ***Identifier:*** MDXH

Reduced liability company tax credits (RLCOTC)

Model equation: Imposed variable

$$RLCOTC = RLCOTC(-1) \quad (2.97)$$

Unit: £m ***Source:*** ONS ***Identifier:*** JPPT- MDXH

Central government subsidies on production (CGSUBPR)

Model equation: Imposed variable

$$CGSUBPR = CGSUBPR(-1) \quad (2.98)$$

Unit: £m ***Source:*** ONS ***Identifier:*** NMCC

Central government total subsidies: products and production (CGTSUB)

Model equation: Technical relationship (identity)

$$CGTSUB = CGSUBP + CGSUBPR \quad (2.99)$$

Unit: £m **Source:** ONS **Identifier:** NMCD

Local authority subsidies on production (LASUBPR)

Model equation: Imposed variable

$$LASUBPR = (LASUBPR(-4) + LASUBPR(-3) + LASUBPR(-2) + LASUBPR(-1))*0.25*(PDGP*4)/(PGDP(-4)+PGDP(-3)+PGDP(-2)+PGDP(-1)) \quad (2.100)$$

Unit: £m **Source:** ONS **Identifier:** LIUC

Local authority subsidies on products (LASUBP)

Model equation: Imposed variable

$$LASUBP = LASUBP(-1) \quad (2.101)$$

Unit: £m **Source:** ONS **Identifier:** ADAK-LIUC

Local authority total subsidies: products and production (LATSUB)

Model equation: Technical relationship (identity)

$$LATSUB = LASUBP+LASUBPR \quad (2.102)$$

Unit: £m **Source:** ONS **Identifier:** ADAK

Local authority net social benefits to households (LASBHH)

Model equation: Imposed variable

$$LASBHH = LASBHH(-1) \quad (2.103)$$

Unit: £m **Source:** ONS **Identifier:** GZSK

Total grants from central government to local authority (CGCGLA)

Model equation: Imposed variable

$$CGCGLA = CGCGLA(-1) \quad (2.104)$$

Unit: £m **Source:** ONS **Identifier:** QYJR

Central government net social benefits to households (CGSB)

Model equation: Imposed variable

$$CGSB = CGSB(-1) \quad (2.105)$$

Unit: £m **Source:** ONS **Identifier:** GZSJ

Debt interest payments on national savings (DIPNSC)

Model equation: Imposed variable

$$DIPNSC = DIPNSC(-1) \quad (2.106)$$

Unit: £m **Source:** ONS **Identifier:** XACX

Interest payments on gilts redeemed and other flows (REDOTH)

Model equation: Imposed variable

REDOTH = *REDOTH(-1)* *(2.107)*

Unit: *£m* ***Source:*** *OBR* ***Identifier:*** *-*

Weighted gilt rate (GILTRATE)

Model equation: Imposed variable

GILTRATE = *GILTRATE(-1)* *(2.108)*

Unit: *Rate* ***Source:*** *OBR* ***Identifier:*** *-*

Debt interest payments on conventional gilts (DIPLDC)

Model equation: Imposed variable

DIPLDC = *DIPLDC(-1)* *(2.109)*

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *CUEM*

Debt interest payments on index-linked gilts (IILG)

Model equation: Imposed variable

IILG= *IILG(-1)* *(2.110)*

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *CMSU*

Accrued uplift on index-linked gilts (ILGUP)

Model equation: Imposed variable

ILGUP= *ILGUP(-1)* *(2.111)*

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *NMRB*

Comment: Central Government disbursements on index-lined gilts have two components: the interest payments itself (IILG), and the accrued uplift (ILGUP).

Accruals adjustment on index-linked gilts (ILGAC)

Model equation: Imposed variable

ILGAC= *ILGAC(-1)* *(2.112)*

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *-NMQZ*

Central government interest/dividends paid to private sector and rest of the world (DICGOP)

Model equation: Imposed variable

DICGOP= *DICGOP(-1)* *(2.113)*

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *NMFX*

Local authority interest/dividends paid to private sector and rest of the world (DILAPR)

Model equation: Imposed variable

DILAPR= *DILAPR(-1)* *(2.114)*

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *NUGW*

Central government net interest and dividends from public sector (CGINTRA)

Model equation: Imposed variable

$$CGINTRA = CGINTRA(-1) \quad (2.115)$$

Unit: £m **Source:** ONS **Identifier:** ANNY

Local authority net interest and dividends from public sector (LAINTRA)

Model equation: Imposed variable

$$LAINTRA = LAINTRA(-1) \quad (2.116)$$

Unit: £m **Source:** ONS **Identifier:** ANPZ

Public corporations net interest and dividends from public sector (PCINTRA)

Model equation: Imposed variable

$$PCINTRA = PCINTRA(-1) \quad (2.117)$$

Unit: £m **Source:** ONS **Identifier:** ANRW

Central government actual social contributions (CGASC)

Model equation: Technical relationship

$$ratio(CGASC) = ratio(CGWS) \quad (2.118)$$

Unit: £m **Source:** ONS **Identifier:** GCMP

Central government imputed social contributions (CGISC)

Model equation: Technical relationship

$$ratio(CGISC) = ratio(CGWS) \quad (2.119)$$

Unit: £m **Source:** ONS **Identifier:** QYJS+RUDY

Central government employee social contributions (EESCCG)

Model equation: Technical relationship

$$ratio(EESCCG) = ratio(CGWS) \quad (2.120)$$

Unit: £m **Source:** ONS **Identifier:** CX3X+FJBH

Local authority imputed social contributions (LASC)

Model equation: Technical relationship

$$ratio(LASC) = ratio(LAWS) \quad (2.121)$$

Unit: £m **Source:** ONS **Identifier:** GCMN

Local authority employee social contributions (EESCLA)

Model equation: Technical relationship

$$ratio(EESCLA) = ratio(LAWS) \quad (2.122)$$

Unit: £m **Source:** ONS **Identifier:** NMWN

Working Families Tax Credit scoring as negative tax (WFTCNT)

Model equation: Imposed variable

WFTCNT = *WFTCNT(-1)* *(2.123)*

Unit: £m ***Source:*** ONS ***Identifier:*** -MDYN+MDYM

Central government net current grants abroad (CGNCGA)

Model equation: Technical relationship (identity)

CGNCGA = *ECNET+TROD* *(2.124)*

Unit: £m ***Source:*** ONS ***Identifier:*** GZST

Local authority net current grants abroad (LANCGA)

Model equation: Imposed variable

LANCGA = *LANCGA(-1)* *(2.125)*

Unit: £m ***Source:*** ONS ***Identifier:*** G626

Central government other current grants (CGOTR)

Model equation: Imposed variable

CGOTR = *CGOTR(-1)* *(2.126)*

Unit: £m ***Source:*** ONS ***Identifier:*** NMFC

Local authority other current grants (LAOTRHH)

Model equation: Imposed variable

LAOTRHH = *LAOTRHH(-1)* *(2.127)*

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *EBFE*

Central government miscellaneous spending (CGMISP)

Model equation: Imposed variable

CGMISP = *CGMISP(-1)* *(2.128)*

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *ANRS-ABIF*

Local authority miscellaneous spending (LAMISE)

Model equation: Imposed variable

LAMISE = *LAMISE(-1)* *(2.129)*

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *LSIB*

Local authority payments of national non-domestic rates (LANNDR)

Model equation: Imposed variable

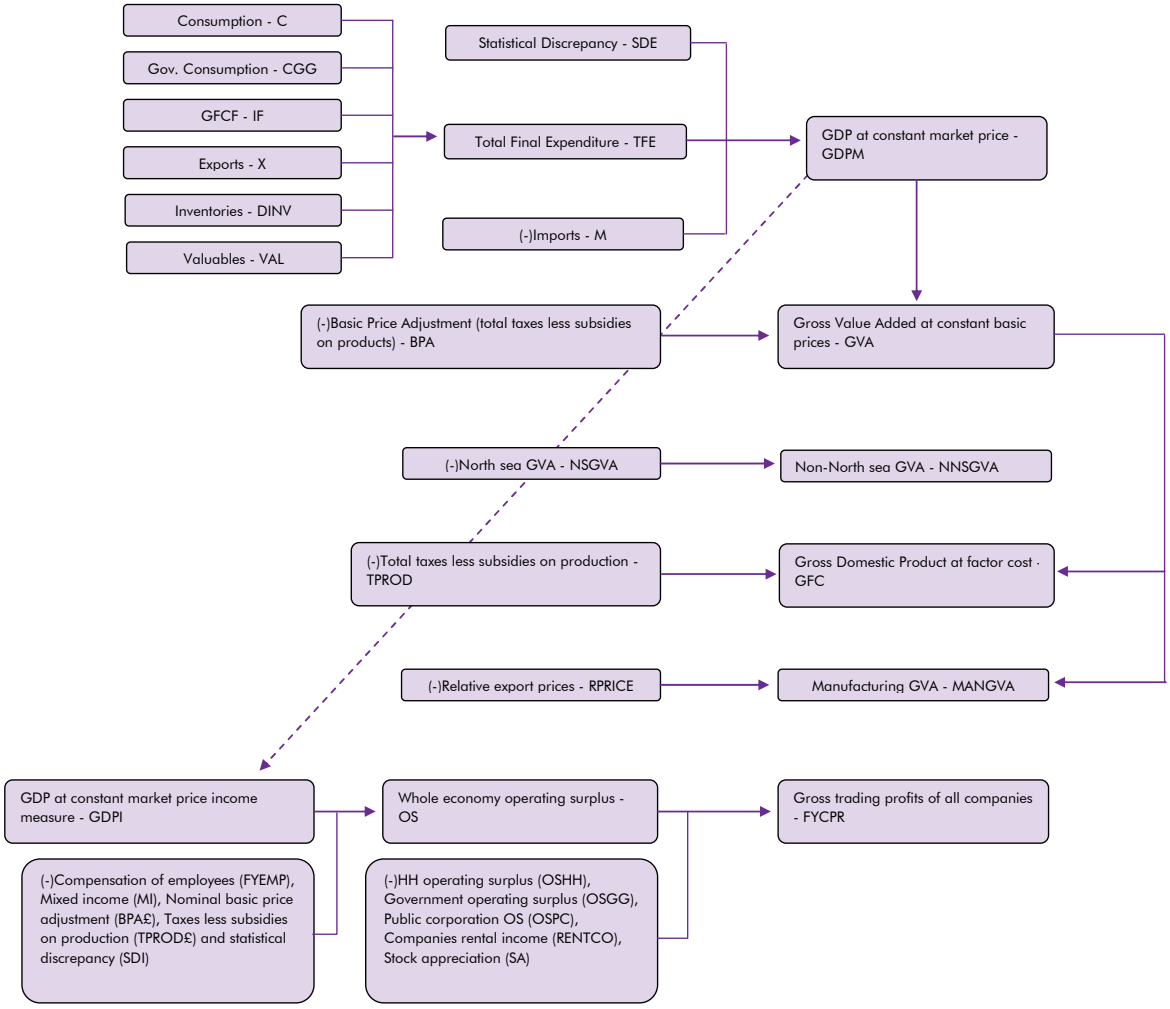
LANNDR = *LANNDR(-1)* *(2.130)*

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *CQOQ*

Gross Domestic Product

This group contains identities for the expenditure and income measures of Gross Domestic Product.

Figure 2.6: Gross Domestic Product



GDP (expenditure measure)

Total Final Expenditure at current prices (TFE£)

Model equation: Technical relationship (identity)

$$TFE£ = CGG£ + C£ + DINV£ + VAL£ + IF£ + X£ \qquad (2.131)$$

Unit: £m ***Source:*** ONS ***Identifier:*** ABMF

Statistical discrepancy at current prices (expenditure measure) (SDE£)

Model equation: Technical relationship (identity)

$$SDE£ = PGDP*(SDE/100) \quad (2.132)$$

Unit: £m **Source:** ONS **Identifier:** GIXM

Gross Domestic Product at current market prices (GDPM£)

Model equation: Technical relationship (identity)

$$GDPM£ = TFE£ - M£ + SDE£ \quad (2.133)$$

Unit: £m **Source:** ONS **Identifier:** YBHA

Gross Domestic Product at current market prices (not seasonally-adjusted) (MGDPNSA)

Model equation: Technical relationship (calendar year identity)

$$MGDPNSA = GDPM£ \quad (2.134)$$

Unit: £m **Source:** ONS **Identifier:** BKTL

Comment: This variable represents non-seasonally adjusted Gross Domestic Product. The quarterly profile will differ to seasonally-adjusted Gross Domestic Product, although the calendar year totals are identical.

Basic Price Adjustment at current prices (BPA£)

Model equation: Technical relationship (identity)

$$BPA£ = CETAX - BETPRF + EXCDUTAC + XLAVAT + LAVAT + TSD + TXMIS + ROCS - (EUSUBP + LASUBP + CGUBP + CCLACA) + BANKROLL + BLEVY \quad (2.135)$$

Unit: £m **Source:** ONS **Identifier:** YBHA - ABML

Gross Value Added at current basic prices (GVA£)

Model equation: Technical relationship (identity)

$$GVA£ = GDPM£ - BPA£ \quad (2.136)$$

Unit: £m **Source:** ONS **Identifier:** ABML

Total Final Expenditure at constant prices (TFE)

Model equation: Technical relationship (identity)

$$TFE = CGG + C + DINV + VAL + IF + X \quad (2.137)$$

Unit: £m, CVM **Source:** ONS **Identifier:** ABMG

Statistical discrepancy at constant prices (expenditure measure) (SDE)

Model equation: Imposed variable

$$SDE = SDE(-1) \quad (2.138)$$

Unit: £m, CVM **Source:** ONS **Identifier:** GIXS

Gross Domestic Product at constant market prices (GDPM)

Model equation: Technical relationship (identity)

$$GDPM = TFE - M + SDE \quad (2.139)$$

Unit: £m, CVM **Source:** ONS **Identifier:** ABMI

Basic Price Adjustment at constant prices (BPA)

Model equation: Technical relationship

$$ratio(BPA) = ratio(GDPM) \quad (2.140)$$

Unit: £m, CVM **Source:** ONS **Identifier:** NTAO

Gross Value Added at constant basic prices (GVA)

Model equation: Technical relationship (identity)

$$GVA = GDPM - BPA \quad (2.141)$$

Unit: £m, CVM **Source:** ONS **Identifier:** ABMM

Gross Value Added deflator (PGVA)

Model equation: Technical relationship (identity)

$$PGVA = 100*(GVA£/GVA) \quad (2.142)$$

Unit: Index **Source:** ONS **Identifier:** CGBV

Gross Domestic Product deflator (PGDP)

Model equation: Technical relationship (identity)

$$PGDP = 100*(GDP£/GDP) \quad (2.143)$$

Unit: Index **Source:** ONS **Identifier:** YBGB

Taxes less subsidies on production in current prices (TPROD£)

Model equation: Technical relationship (identity)

$$TPROD£ = NNDRA + NIS + VEDCO + OPT + LAPT + EUETS - CGSUBPR - LASUBPR - EUSUBPR \quad (2.144)$$

Unit: £m **Source:** ONS **Identifier:** CMVL - NTAP

Taxes less subsidies on production in constant prices (TPROD)

Model equation: Technical relationship

$$ratio(TPROD) = ratio(GVA) \quad (2.145)$$

Unit: £m, CVM **Source:** ONS **Identifier:** ABMM - YBHH

Gross Domestic Product at factor cost, constant prices (GFC)

Model equation: Technical relationship

$$GFC = GVA - TPROD \quad (2.146)$$

Unit: £m, CVM **Source:** ONS **Identifier:** YBHH

GDP (income measure)

Statistical discrepancy at current prices (income measure) (SDI)

Model equation: Imposed variable

$$SDI = SDI(-1) \quad (2.147)$$

Unit: £m **Source:** ONS **Identifier:** GIXQ

Whole economy gross operating surplus (OS)

Model equation: Technical relationship (identity)

$$OS = GDPM£ - FYEMP - MI - BPA£ - TPROD£ - SDI \quad (2.148)$$

Unit: £m **Source:** ONS **Identifier:** ABNG

Private sector companies' rental income (RENTCO)

Model equation: Technical relationship

$$ratio(RENTCO) = ratio(GDPM£) \quad (2.149)$$

Unit: £m **Source:** ONS **Identifier:** DTWR + DTWS

Gross operating surplus of households and non-profit institutions serving households (OSHH)

Model equation: Behavioural equation

$$OSHH = 12874 + 0.85*IROO - DIPHHmf \quad (2.150)$$

Unit: £m **Source:** ONS **Identifier:** CAEN

where:

$$IROO = PRENT*POP16/1000$$

Financial Intermediation Services Indirectly Measured (FISIM) generated from General Government (FISMGG)

Model equation: Imposed variable

$$FISIMGG = 0 \quad (2.151)$$

Unit: £m **Source:** ONS **Identifier :** C6GA+C6G9+C6FQ+C6FP

Financial Intermediation Services Indirectly Measured (FISIM) generated from Rest of World (FISIMROW)

Model equation: Imposed variable

$$FISIMROW = FISIMROW(-1) \quad (2.152)$$

Unit: £m **Source:** ONS **Identifier :** IV8F + IV8E

Total Financial Intermediation Services Indirectly Measured (FISIM) in current prices (FISIM£)

Model equation: Technical relationship (identity)

$$FISIM£ = DIRHHf + DIPHHuf + DIPHHmf + DIRICf + DIPICf + FISIMGG + FISIMROW \quad (2.153)$$

Unit: £m ***Source:*** ONS ***Identifier :*** IE9R

Comment: FISIM represents the difference between Bank Rate and lending rates to the wider economy and is the value of financial services consumed by households and firms.

Gross trading profits of private companies (FYCPR)

Model equation: Technical relationship (identity)

$$FYCPR = OS - OSHH - OSGG - OSPC - RENTCO + SA - FISIM£ \quad (2.154)$$

Unit: £m ***Source:*** ONS ***Identifier :*** CAED+CAGD+RITQ

Operating surplus of private companies (OSCO)

Model equation: Technical relationship (identity)

$$OSCO = OS - OSHH - OSGG - OSPC \quad (2.155)$$

Unit: £m ***Source:*** ONS ***Identifier:*** ABNG – CAEN – NMXV – NRJT – JW28

Gross trading profits of non-oil corporations (NNSGTP)

Model equation: Technical relationship (identity)

$$NNSGTP = FYCPR - GTPFC - NSGTP \quad (2.156)$$

Unit: £m ***Source:*** ONS ***Identifier :*** CAED

Gross trading profits of financial corporations (GTPFC)

Model equation: Imposed variable

$$GTPFC = GTPFC\ (-1) \quad (2.157)$$

Unit: £m ***Source:*** ONS ***Identifier :*** RITQ

Total profits of financial corporations (FC)

Model equation: Technical relationship (identity)

$$FC = FISIM£ + GTPFC \quad (2.158)$$

Unit: £m **Source:** ONS **Identifier :** IE9R + RITQ

Gross National Income at market prices (GNI£)

Model equation: Technical relationship (identity)

$$GNI£ = GDPM£ + NIPD + EECOMPC - EECOMPD + EUSUBPR + EUSUBP - EUOT + EUVAT \quad (2.159)$$

Unit: £m **Source:** ONS **Identifier :** ABMZ

Non-oil Gross Value Added (NNSGVA)

Model equation: Technical relationship (identity)

$$NNSGVA = GVA - NSGVA \quad (2.160)$$

Unit: £m, CVM **Source:** ONS **Identifier :** KLS2

Trend output (TRGDP)

Model equation: Imposed variable

$$TRGDP = TRGDP(-1) \quad (2.161)$$

Unit: £m, CVM **Source:** OBR **Identifier :** N/A

Comment: Trend or potential output is constructed off-model as the sum of its components and is imposed. For more details see OBR, 2011, *Forecasting the economy*.

Output gap (GAP)

Model equation: Technical relationship (identity)

$$GAP = (NNSGVA/TRGDP)*100 - 100 \quad (2.162)$$

Unit: Per cent **Source:** OBR **Identifier :** N/A

Market sector Gross Value Added

General government Gross Value Added in current prices (GGVA£)

Model equation: Technical relationship (identity)

$$GGVA£ = CGWS + LAWS + OSGG \quad (2.163)$$

Unit: £m **Source:** ONS **Identifier :** NMXS + NTAR

Market sector Gross Value Added in current prices (MSGVA£)

Model equation: Technical relationship (identity)

$$MSGVA£ = GVA£ - GGVA£ \quad (2.164)$$

Unit: £m **Source:** ONS **Identifier :** ABML - NMXS - NTAR

General government Gross Value Added in constant prices (GGVA)

Model equation: Technical relationship

$$ratio(GGVA) = ratio(CGG) \quad (2.165)$$

Unit: £m, CVM **Source:** OBR **Identifier :** N/A

Market sector Gross Value Added in constant prices (MSGVA)

Model equation: Technical relationship

$$MSGVA = GVA - GGVA \quad (2.166)$$

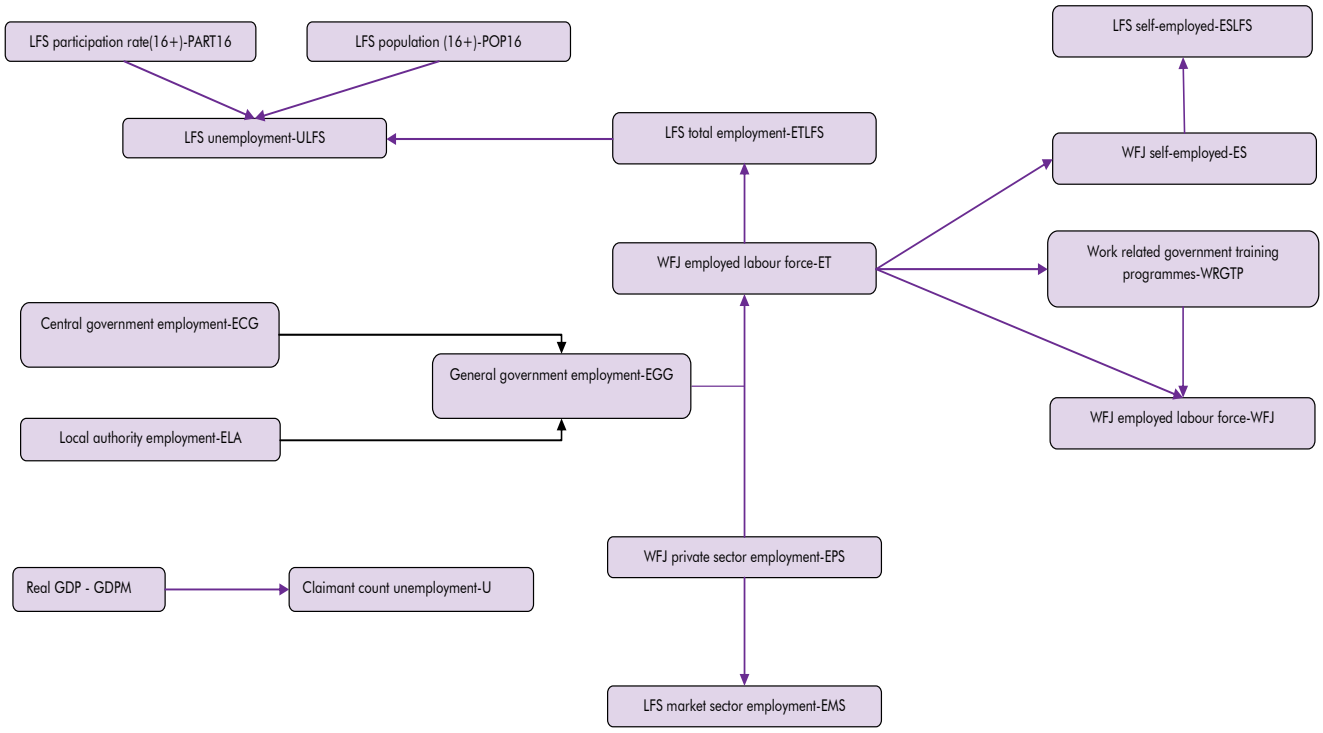
Unit: £m, CVM **Source:** OBR **Identifier :** N/A

3 The labour market

The labour market forecasts include forecasts for the main Labour Force Survey (LFS) aggregates on a 16+ basis. The key aggregates are employment – which can be decomposed into general government employment and market sector employment – LFS unemployment, and the claimant count, which measures the number of individuals claiming Jobseekers allowance and is a key determinant of spending on social security benefits.

Forecasts of the main Labour Force Survey aggregates are closely linked to the potential growth framework. For example, it is generally assumed that the employment rate, participation rate, unemployment rate and average hours gradually return towards their trend or potential levels. Forecasts of potential growth and its components are constructed outside the macroeconomic model; accordingly much of the labour market forecast is determined outside the model. Many of the labour market aggregates in this group are therefore imposed.

Figure 3.1: The labour market



General Government Employment (EGG)

Model Equation: Imposed variable

$$EGG = EGG(-1) \quad (3.1)$$

Unit: 000's **Source:** ONS **Identifier:** G6NW

Central Government Employment (ECG)

Model Equation: Technical relationship

$$ratio(ECG) = ratio(EGG) \quad (3.2)$$

Unit: 000's **Source:** ONS **Identifier:** G6NG

Local Government Employment (ELA)

Model Equation: Technical relationship

$$ratio(ELA) = ratio(EGG) \quad (3.3)$$

Unit: 000's **Source:** ONS **Identifier:** G6NT

Private Sector Employment (EPS)

Model Equation: Technical relationship (identity)

$$dlog(EPS) = log((ET - ECG - ELA)/(ET(-1) - ECG(-1) - ELA(-1))) \quad (3.4)$$

Unit: 000's **Source:** ONS **Identifier:** DYDC-LOJU-G6NG-G6NT

Market Sector Employment (EMS)

Model equation: Technical relationship (identity)

$$EMS = EMS(-1)*(ETLFS - ECG - ELA)/(ETLFS(-1) - ECG(-1) - ELA(-1)) \quad (3.5)$$

Unit: 000's **Source:** ONS **Identifier:** MGRZ-G6NQ-G6NT-MGRT-MGRW

Comment: The Market sector is defined as whole economy excluding central and local Government. This variable grows in line with an endogenously determined growth rate.

Employed Labour Force (ET)

Model equation: Technical relationship

$$ET = ET(-1)*ratio(ETLFS) \quad (3.6)$$

Unit: £M, CVM **Source:** HMT **Identifier:** DYDC-LOJU

Work related Government Training Programs (WRGTP)

Model equation: Technical relationship

$$WRGTP = WRGTP(-1)*ratio(ET) \quad (3.7)$$

Unit: 000's **Source:** ONS **Identifier:** LOJU

Comment: It is assumed that this variable grows in line with total employment in the economy (ET).

Workforce Jobs (WFJ)

Model equation: Technical relationship (identity)

$$WFJ = ET + WRGTP \quad (3.8)$$

Unit: 000's **Source:** ONS **Identifier:** DYDC

Comment: Workforce Jobs (WFJ) figures are a measure of jobs rather than people. For example, if a person holds two jobs, each job will be counted in the WFJ total.

Total LFS Employment (ETLFS)

Model equation: Technical relationship (identity)

$$ETLFS = 1000*(HWA/AVH) \quad (3.9)$$

Unit: 000's **Source:** ONS **Identifier:** MGRZ

Employers and Self-Employed (ES)

Model equation: Technical relationship

$$ratio(ES) = ratio(ET) \quad (3.10)$$

Unit: 000's **Source:** ONS **Identifier:** DYZN

ONS 2010 population projections: children (<16) (GAD1)

Model equation: Imposed variable

$$GAD1 = GAD1(-1) \quad (3.11)$$

Unit: 000's **Source:** ONS **Identifier:** -

ONS 2010 population projections: working age (GAD2)

Model equation: Imposed variable

$$GAD2 = GAD2(-1) \quad (3.12)$$

Unit: 000's **Source:** ONS **Identifier:** -

ONS 2010 population projections: state pension age (GAD3)

Model equation: Imposed variable

$$GAD3 = GAD3(-1) \quad (3.13)$$

Unit: 000's **Source:** ONS **Identifier:** -

ONS 2010 population projections: total (GAD)

Model equation: Technical Relationship (identity)

$$GAD = GAD1 + GAD2 + GAD3 \quad (3.14)$$

Unit: 000's **Source:** ONS **Identifier:** -

Population of 16+ (POP16)

Model equation: Technical relationship

$$Ratio(POP16) = (GAD2 + GAD3)/(GAD2(-1) + GAD3(-1)) \quad (3.15)$$

Unit: 000's **Source:** ONS **Identifier:** MGSL

LFS Unemployment (ULFS)

Model equation: Behavioural Equation

$$ULFS = (POP16*PART16/100) - ETLFS \quad (3.16)$$

Unit: 000's **Source:** ONS **Identifier:** MGSC

LFS Unemployment Rate (LFSUR)

Model equation: Technical relationship

$$LFSUR = 100*ULFS/(ETLFS+ULFS) \quad (3.17)$$

Unit: Per cent **Source:** ONS **Identifier:** MGSX

Claimant Count Unemployment (U)

Model equation: Behavioural Equation

$$\begin{aligned} dlog(U) = {} & \underset{(12.11)}{0.57}*dlog(U(-1)) - \underset{(-7.61)}{1.36}*dlog(GDPM)- \\ & \underset{(-6.98)}{1.39}*dlog(GDPM(-1)) - \underset{(-4.43)}{0.93}*dlog(GDPM(-2))- \\ & \underset{(-3.38)}{0.012}*log(U(-1)) - \underset{(-3.27)}{0.03.}*log(GDPM(-1)) + \\ & \underset{(2.77)}{0.01}*TIME(1983) - \underset{(-1.82)}{0.01}*TIME(1986) - \\ & \underset{(-2.99)}{0.02}*TIME(1996) - \underset{(-1.35)}{0.01}*TIME\ (1979\text{-}80) + \underset{(3.96)}{0.43} \end{aligned} \quad (3.18)$$

Unit: 000's **Source:** ONS **Identifier:** BCJD

Estimation Properties:

Estimation period: 1975Q1 to 2007Q4.

Adjusted $R^2 = 0.91$

Static long-run solution:

$$log(U) = 34.67 - 2.07*log(GDPM)$$

Elasticity of U with respect to a 1% increase in:

	Q1	Q5	Q9	Long-run
GDPM	-3.53%	-7.78%	-7.66%	-2.07%

Comment: The claimant count is modelled as an error correction process where the long run solution relates the level of the claimant count to level of real GDP in the economy. The elasticity implies that a 1 per cent increase in the level of GDP reduces the claimant count by around 2 per cent in the long run.

Claimant Count unemployment rate (UNUKP)

Model equation: Technical relationship (identity)

*UNUKP = 100*U/(U+WFJ)* *(3.19)*

Unit: *Per cent* ***Source:*** *ONS* ***Identifier:*** *BCJE*

Total Hours Worked: 16+ (H16)

Model equation: Imposed variable

H16 = H16(-1) *(3.20)*

Unit: *000's* ***Source:*** *ONS* ***Identifier:*** *YBUS*

Total Hours Worked

Model equation: Imposed variable

HWA = H16 *(3.21)*

Unit: *000's* ***Source:*** *ONS* ***Identifier:*** *YBUS*

Non-oil productivity per hour (PRODH)

Model equation: Technical relationship (identity)

PRODH = NNSGVA/HWA *(3.22)*

Unit: *000's* ***Source:*** *OBR* ***Identifier:*** *-*

Average weekly hours, all workers (AVH)

Model equation: Imposed variable

AVH = AVH(-1) (3.23)

Unit: *000's* ***Source:*** *ONS* ***Identifier:*** *YBUV*

16+ Activity Rate (PART16)

Model equation: Technical relationship (identity)

PART16 = 100(ULFS+ETLFS)/POP16* (3.24)

Unit: *Per cent* ***Source:*** *ONS* ***Identifier:*** *MGWG*

16+ Employment Rate (ER)

Model equation: Technical relationship (identity)

*ER = 100*ETLFS/POP16* (3.25)

Unit: *Per cent* ***Source:*** *ONS* ***Identifier:*** *MGSR*

4 Prices, costs and earnings

This group contains average earnings and all the price equations in the model, including the expenditure deflators, trade prices and world prices.

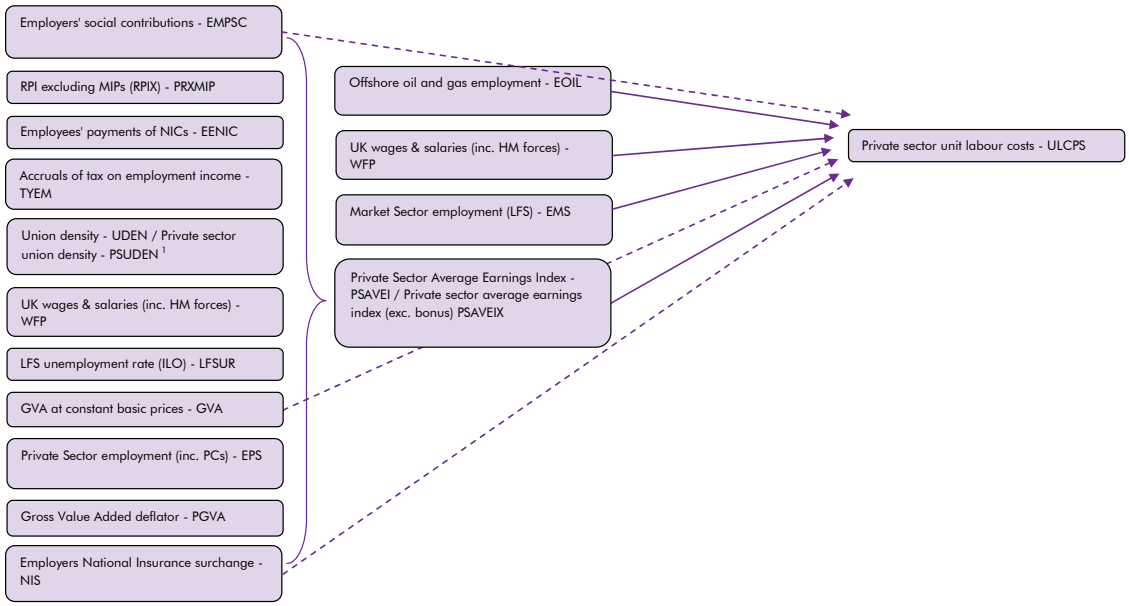
The equations for consumer prices are specified as a function of industry cost indices and profit margins. These cost indices (for manufacturing, private services, construction and utilities output) weight together proxies for the various primary costs of producing gross output: unit labour costs, imported intermediate goods and services, oil and gas, indirect taxes and the cost of intermediate output from the other domestic industries. The weights are based on Input-Output information on the consolidated (that is, excluding intermediate output from within that industry) cost base of each industry, from the 2005 Analytical Tables. Unfortunately more up-to-date Supply-Use data does not have the required detail, in particular on the split of imports between intermediate and final demand.

Imposed margins are added to the relevant cost indices to model manufacturing wholesale prices excluding taxes (PPIY) and CPI excluding housing costs (CPIX). Additional items – such as rent and council tax – are then added to forecast other price indices, such as RPI (PR), under the assumption of unchanged weights.

The model does not have an explicit Phillips Curve that directly links a measure of spare capacity to inflation. However there is an implicit relationship in the unit cost framework. A low (high) level of unemployment increase (lowers) average earnings in the private sector relative to productivity (see the equation for PSAVEI), generating an increase (decrease) in unit labour costs. This pushes up the cost indices, and so feeds through to inflation (assuming unchanged margins).

It should be noted that the OBR forecast is based a range of different approaches. For example, the short-term forecast for CPI inflation is informed by the outlook for each of the CPI components. The unit cost approach specified in this group should be seen as an alternative way to decompose and evaluate the CPI inflation forecast, rather than acting as the central forecasting framework. More details of the OBR's approach to forecasting inflation can be found in OBR, 2011, *Forecasting the economy*.

Figure 4.1: Earnings



[1] Private sector union density (PSUDEN) is used to calculate Private Sector Average Earnings Index excluding bonuses (PSAVEIX) whereas union density (UDEN) is used for Private Sector Average Earnings Index (PSAVEI).

Figure 4.2: GDP(E) deflators

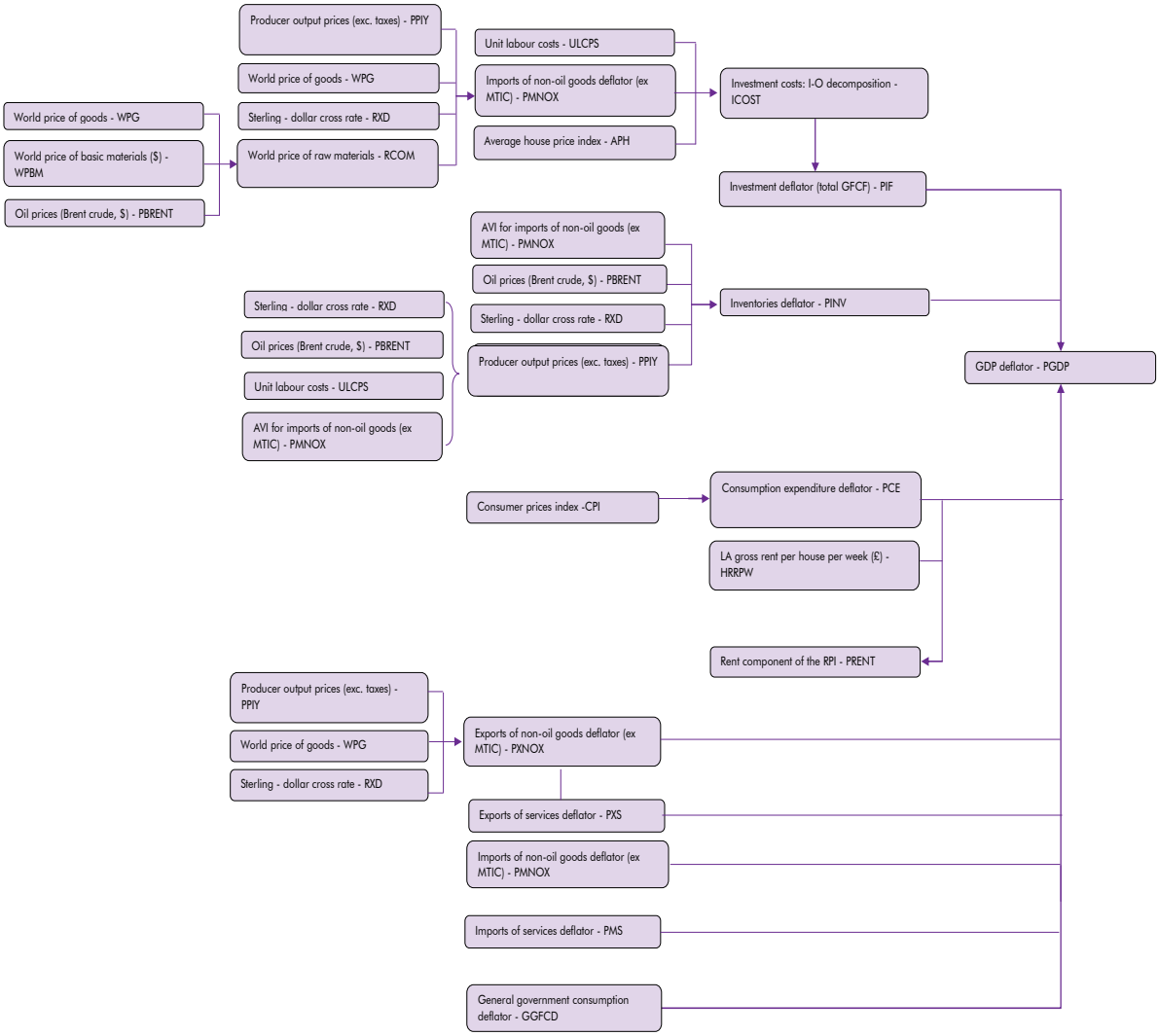
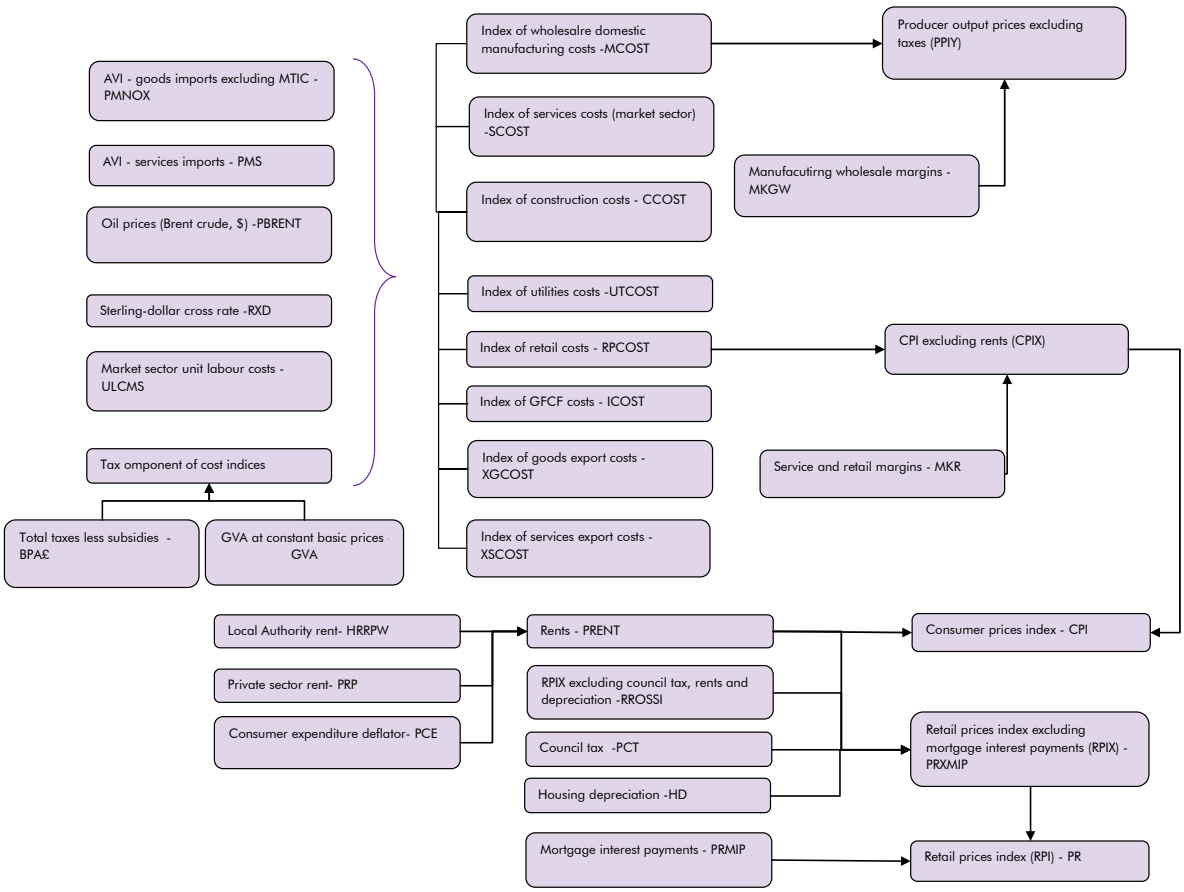


Figure 4.3: CPI and RPI inflation



Earnings

Union density (UDEN)

Model equation: Imposed variable

$$UDEN = UDEN(-1) \qquad (4.1)$$

Unit: *Rate (constant from 1980Q4)* ***Source:*** *See comment* ***Identifier:*** -

Comment: This is sourced from the Department of Employment Gazette but is set constant from 1980Q4, it is likely that this variable proxies structural changes in the labour market prior to this date.

Private sector union density (PSUDEN)

Model equation: Imposed variable

$$PSUDEN = PSUDEN(-1) \quad (4.2)$$

Unit: Rate **Source:** OBR **Identifier:** -

Private sector average earnings index (inc. bonus) (PSAVEI)

Model equation: Behavioural equation

$$\begin{aligned} dlog(PSAVEI) = {} & -0.21*log((PSAVEI(-1)*(1 + (EMPSC+NIS)/WFP)) \quad (4.3) \\ & \quad (-5.59) \\ & /((PGVA(-1))*(GVA(-1)/EPS(-1)))) \\ & + 0.53*dlog(PGVA) + 0.18*dlog(PGVA(-1)) \\ & \quad (6.54) \qquad\qquad (2.85) \\ & + 0.09*dlog(PGVA(-2)) \\ & \quad (1.40) \\ & +(1 - 0.53 - 0.18 - 0.09)*dlog(PGVA(-3)) \\ & \qquad\qquad (3.12) \\ & - 0.02*dlog(LFSUR) - 0.01*log(LFSUR(-1)) \\ & \quad (-0.76) \qquad\qquad (-3.94) \\ & + 0.27*(dlog(GVA) - dlog(EPS)) \\ & \quad (3.37) \\ & + 0.03*log(UDEN) + 0.10*(dlog(PRXMIP)- \\ & \quad (1.16) \qquad\qquad (1.40) \\ & dlog(PGVA)) \\ & - 0.04*(log(1 - (TYEM(-3)+EENIC(-3))/WFP(-3)) \\ & \quad (-1.03) \\ & - log(1 - (TYEM(-4)+EENIC(-4))/WFP(-4))) \\ & - 0.012*(ifge(197504)*ifle(197901)) - 0.390 \\ & \quad (-5.15) \qquad\qquad\qquad\qquad (-5.61) \end{aligned}$$

Unit: Index **Source:** ONS **Identifier:** KAC4

Equation properties

Estimation period: 1972Q4 to 2007Q4.

Static long-run solution:

$$log\ PSAVEI = log(GVA/EPS) + log(PGVA) - log\ ((1+EMPSC+NIS)/WFP) + 0.141log(UDEN) - 0.02log(LFSUR) - 1.83$$

Comment: This equation is based on the familiar Layard-Nickell model in which wages (but not employment) are set in a bargaining framework. The data was not supportive of long-run effects from the tax and terms of trade wedges. Pressure of demand effects are captured by a term in the LFS measure of unemployment. This measure may be a better indicator of labour market pressure than the claimant count since it includes job seekers not in receipt of benefit but excludes benefit claimants who reply in the survey question that they are not actively searching for work.

The equation is estimated using the Average Earnings Index (AEI), rather than Average Weekly Earnings (AWE). While AWE replaced AEI as the official measure of earnings in January 2010, the AEI has a significantly longer time series: at the time of writing, AWE series extend back only to 2000, meaning that it has not yet been possible to estimate an equation on the basis of AWE.

Private sector average earnings index (exc. bonus) (PSAVEIX)

Model equation: Behavioural equation

$$
\begin{aligned}
dlog(PSAVEIX) = \; & -0.17*log((PSAVEIX(-1)*(1+(EMPSC+NIS)/WFP)) \\
& \underset{(-4.49)}{} \\
& /((PGVA(-1))*(GVA(-1)/EPS(-1)))) \\
& \\
& + 0.51*dlog(PGVA) + 0.20*dlog(PGVA(-1)) \\
& \quad \underset{(6.59)}{} \qquad \underset{(3.29)}{} \\
& + 0.08*dlog(PGVA(-2)) \\
& \quad \underset{(1.32)}{} \\
& + (1 - 0.51 - 0.20 - 0.08)*dlog(PGVA(-3)) \\
& \qquad \underset{(3.31)}{} \\
& - 0.03*dlog(LFSUR) - 0.01*log(LFSUR(-1)) \\
& \quad \underset{(-1.20)}{} \qquad \underset{(-3.72)}{} \\
& + 0.23*(dlog(GVA) - dlog(EPS)) \\
& \quad \underset{(3.04)}{} \\
& + 0.01*log(PSUDEN) + 0.11*(dlog(PRXMIP)- \\
& \quad \underset{(1.94)}{} \qquad \underset{(1.57)}{} \\
& dlog(PGVA)) \\
& \\
& - 0.02*(log(1 - (TYEM(-3)+EENIC(-3))/WFP(-3)) \\
& \quad \underset{(0.48)}{} \\
& - log(1 - (TYEM(-4)+EENIC(-4))/WFP(-4))) \\
& \\
& - 0.01*(ifge(197504)*ifle(197901)) - 0.35 \\
& \quad \underset{(-4.79)}{} \qquad\qquad\qquad\qquad\qquad \underset{(-4.71)}{}
\end{aligned}
\qquad (4.4)
$$

Unit: Index **Source:** ONS **Identifier:** JQEC

Equation properties:

Estimation period: 1972Q1 to 2007Q4

Static long-run solution:

$$
\begin{aligned}
log\ PSAVEIX = \; & log(GVA/EPS)+log(PGVA)- log\ ((1+EMPSC+NIS)/WFP) + \\
& 0.04log(UDEN) - 0.05log(LFSUR) - 2.03
\end{aligned}
$$

Elasticity of PSAVEIX with respect to a 1% increase in:

	Q1	Q5	Q9	Long-run
GVA deflator (PGVA)	0.513%	1.110%	1.052%	1.000%
Private sector productivity (GVA/EPS)	0.231%	0.640%	0.832%	1.000%
Employers tax rate (1+(EMPSC+NIS))/WFP	-0.173%	-0.613%	-0.819%	-1.000%
Unemployment rate (LFSUR)	-0.026%	-0.038%	-0.044%	-0.049%
Union density (UDEN)	0.006%	0.020%	0.026%	0.032%

Comment: This equation specifies a relationship for regular earnings excluding bonuses, and is of the same form as the equation for total earnings including bonuses (see PSAVEI above).

As with the equation for total earnings, this equation is estimated using the Average Earnings Index (AEI), rather than Average Weekly Earnings (AWE). While AWE replaced AEI as the official measure of earnings in January 2010, the AEI has a significantly longer time series: at the time of writing, AWE series extend back only to 2000, meaning that it has not yet been possible to estimate an equation on the basis of AWE.

CG average earnings index (2000=100) (ERCG)

Model equation: Imposed variable

ERCG = *ERCG(-1)* *(4.5)*

Unit: *Index* ***Source:*** *ONS* ***Identifier:*** *NMAI/ C9K9*

LA average earnings index (2000=100) (ERLA)

Model equation: Imposed variable

ERLA = *ERLA(-1)* *(4.6)*

Unit: *Index* ***Source:*** *ONS* ***Identifier:*** *NMJF/C9KA*

Time varying coefficient for wages & salaries (ADJW)

Model equation: Technical relationship

$$ADJW = (WFP - ((52/4000)(1*ERCG*ECG) + (52/4000)(1*ERLA*ELA)))/(PSAVEI*(EMS - ES) \quad (4.7)$$

Unit: - *Source:* OBR *Identifier:* N/A

Comment: Whole economy wages and salaries is defined as the sum of general government and 'market' sector wages and salaries, but when this is calculated as the sum of average earnings indices multiplied by employment there is a small residual that is captured by this variable.

Private sector Unit Labour Costs (ULCPS)

Model equation: Technical relationship

$$ULCPS = 0.18*(PSAVEI*(52/4)*(1 + (EMPSC + NIS)/WFP)* EMS/GVA) \quad (4.8)$$

Unit: - *Source:* OBR *Identifier:* N/A

Market Sector Unit Labour Costs (2010 = 100) (ULCMS)

Model equation: Technical relationship

$$ULCMS = 100*1.67 *FYEMPMS* (1 + (MI/MSGVA£EMP))/MSGVA \quad (4.9)$$

Unit: - *Source:* OBR *Identifier:* N/A

Market Sector GVA excluding self-employed sector (MSGVA£EMP)

Model equation: Technical relationship (identity)

$$MSGVA£EMP = MSGVA£ - MI \quad (4.10)$$

Unit: - *Source:* OBR *Identifier:* N/A

Comment: Mixed income constitutes both capital and labour income. It is assumed the proportion is the same as for the rest of Market Sector income. The coefficient 1.6715 normalises so the index equals 100 in 2010.

Market Sector employee income (FYEMPMS)

Model equation: Technical relationship (identity)

$$FYEMPMS = FYEMP - CGWS - LAWS \quad (4.11)$$

Unit: - *Source:* OBR *Identifier:* N/A

Cost indices and margins

Index of costs: wholesale domestic manufacturing (MCOST)

Model equation: Technical relationship

$$\begin{aligned} MCOST = {} & 36.83*(ULCMS/ULCMSBASE) \\ & + 24.64*(PMNOX/PMNOXBASE) \\ & + 4.04*(PMS/PMSBASE) \\ & + 4.85*((PBRENT/RXD)/OILBASE) \\ & + 1.01*((BPA£/GVA)/TXRATEBASE) \\ & + 24.72*(SCOST/100) \\ & + 0.47*(CCOST/100) + 3.43*(UTCOST/100) \end{aligned} \quad (4.12)$$

Unit: Index *Source:* OBR *Identifier:* N/A

Comment: This is an index for the gross cost of producing manufacturing output. The weights are based on Input-Output information from the 2005 analytical tables, which can identify the cost base of the domestic manufacturing sector. All proxies for costs are normalised to equal 1 in the base year. The term in PBRENT is a proxy for the sterling cost of oil and gas prices. The term featuring the Basic Price Adjustment is a proxy for indirect taxes.

Index of costs: Market Sector services output (SCOST)

Model equation: Technical relationship

$$\begin{aligned} SCOST = {} & 70.54*(ULCMS/ULCMSBASE) \\ & + 6.93*(PMNOX/PMNOXBASE) \\ & + 6.41*(PMS/PMSBASE) \\ & + 0.09*((PBRENT/RXD)/OILBASE) \\ & + 3.52*((BPA£/GVA)/TXRATEBASE) \\ & + 9.78*(PPIY/PPIYBASE) + 1.64*(CCOST/100) \\ & + 1.09*(UTCOST/100) \end{aligned} \quad (4.13)$$

Unit: Index *Source:* OBR *Identifier:* N/A

Comment: See comment for MCOST.

Index of costs: construction output (CCOST)

Model equation: Technical relationship

$$
\begin{aligned}
CCOST = \; & 40.25*(ULCMS/ULCMSBASE) \\
& + 2.80*(PMNOX/PMNOXBASE) \\
& + 0.90*(PMS/PMSBASE) \\
& + 0.03*((PBRENT/RXD)/OILBASE) \\
& + 0.51*((BPA£/GVA)/TXRATEBASE) \\
& + 27.06*(PPIY/PPIYBASE) + 28.13*(SCOST/100) \\
& + 0.34*(UTCOST/100)
\end{aligned}
\qquad (4.14)
$$

Unit: Index **Source:** OBR **Identifier:** N/A

Comment: See comment for CCOST.

Index of costs: utilities output (UTCOST)

Model equation: Technical relationship

$$
\begin{aligned}
UTCOST = \; & 14.85*(ULCMS/ULCMSBASE) \\
& + 3.04*(PMNOX/PMNOXBASE) \\
& + 0.51*(PMS/PMSBASE) \\
& + 51.52*((PBRENT/RXD)/OILBASE) \\
& + 2.90*((BPA£/GVA)/TXRATEBASE) \\
& + 8.24*(PPIY/PPIYBASE) + 16.00*(SCOST/100) \\
& + 2.95*(CCOST/100)
\end{aligned}
\qquad (4.15)
$$

Unit: Index **Source:** OBR **Identifier:** N/A

Comment: See comment for CCOST.

Index of retail costs (RPCOST)

Model equation: Technical relationship

$$\begin{aligned} RPCOST = \; & 13.18*(PMNOX/PMNOXBASE) \\ & + 4.07*(PMS/PMSBASE) \\ & + 11.56*((BPA£/GVA)/TXRATEBASE) \\ & + 7.07*(PPIY/PPIYBASE) + 59.96*(SCOST/100) \\ & + 0.92*(CCOST/100) + 3.24*(UTCOST/100) \end{aligned} \qquad (4.16)$$

Unit: Index **Source:** OBR **Identifier:** N/A

Comment: This is an index of the gross cost – excluding return to capital - of supplying the output in the CPI basket, excluding housing costs. It is written in terms of the cost indices for each industrial sector, which in turn depend on 'primary' drivers of costs and inflation. It also captures the cost of imported consumption goods and services, and indirect taxes. It is the most relevant cost index for explaining CPI inflation.

Index of costs: GFCF (ICOST)

Model equation: Technical relationship

$$\begin{aligned} ICOST = \; & 18.40*(PMNOX/PMNOXBASE) \\ & + 0.41*(PMS/PMSBASE) \\ & + 0.19*((PBRENT/RXD)/OILBASE) \\ & + 5.63*((BPA£/MSGVA)/TXRATEBASE) \\ & + 8.18*(PPIY/PPIYBASE) + 20.76*(SCOST/100) \\ & + 46.42*(CCOST/100) \end{aligned} \qquad (4.17)$$

Unit: Index **Source:** OBR **Identifier:** N/A

Comment: An index of the cost of supplying final demand for investment. The weights are derived by using the Input-Output tables to map from GDP by expenditure component to GVA by industry.

Index of costs: Goods Exports (XGCOST)

Model equation: Technical relationship

$$XGCOST = 15.77*(PMNOX/PMNOXBASE) + 2.92*((BPA£/MSGVA)/TXRATEBASE) + 68.46*(PPIY/PPIYBASE) + 12.80*(SCOST/100) + 0.05*(UTCOST/100) \quad (4.18)$$

Unit: Index **Source:** OBR **Identifier:** N/A

Comment: See comment for ICOST.

Index of costs: Services Exports (XSCOST)

Model equation: Technical relationship

$$XSCOST = 7.22*(PMS/PMSBASE) + 5.99*((BPA£/MSGVA)/TXRATEBASE) + 9.29*(PPIY/PPIYBASE) + 75.39*(SCOST/100) + 1.90*(CCOST/100) + 0.21*(UTCOST/100) \quad (4.19)$$

Unit: Index **Source:** OBR **Identifier:** N/A

Comment: See comment for ICOST.

Manufacturing wholesale margins (MKGW)

Model equation: Imposed variable

$$MKGW = MKGW(-1) \quad (4.20)$$

Unit: Index **Source:** OBR **Identifier:** N/A

Comment: This is a mark-up of prices over gross costs. As such, movements are correlated with, but not identical to, the capital share for the manufacturing sector. In the data, this is calculated as the ratio of PPIY (see below) over the cost index MCOST. In the forecast this is treated as imposed.

Service and retail margins (MKR)

Model equation: Imposed variable

$$MKR = MKR(-1) \quad (4.21)$$

Unit: Index **Source:** OBR **Identifier:** N/A

Comment: This is a mark-up of prices over gross costs. As such, movements are correlated with, but not identical to, the capital share for the non-manufacturing Market Sector. In the data, this is calculated as the ratio of CPIX (see below) over the cost index RPCOST. In the forecast this is treated as imposed.

Inflation indices

Producer output Price Index ex. taxes (PPIY)

Model equation: Technical relationship

$$PPIY = (MCOST/100)*(MKGW/100)*PPIYBASE \quad (4.22)$$

Unit: Index **Source:** ONS **Identifier:** JVZ8

CPI index ex. rent (CPIX)

Model equation: Technical relationship

$$CPIX = (RPCOST/100)*(MKR/100)*CPIXBASE \quad (4.23)$$

Unit: Index **Source:** OBR, ONS **Identifier:** N/A

Comment: This series is derived in the data by removing rent from the all-items CPI index (see CPI below).

World Price of Goods (WPG)

Model equation: Imposed variable

$$WPG = WPG(-1) \quad (4.24)$$

Unit: Index **Source:** IMF **Identifier:** -

Comment: The world price of goods is the IMF advanced economy manufactures price.

World Price of Basic Materials

Model equation: Imposed variable

$$WPBM = WPBM(-1) \quad (4.25)$$

Unit: Index **Source:** IMF **Identifier:** -

RPIX excluding council tax, rents and depreciation (RROSSI)

Model equation: Imposed variable

$$RROSSI = RROSSI(-1) \quad (4.26)$$

Unit: Index **Source:** ONS **Identifier:** GUMF

Housing: Council tax & rates RPI (PCT)

Model equation: Imposed variable

$$PCT = PCT(-1) \quad (4.27)$$

Unit: Index **Source:** ONS **Identifier:** DOBR

LA gross rent per house per week (HRRPW)

Model equation: Imposed variable

$$HRRPW = HRRPW(-1) \quad (4.28)$$

Unit: Index **Source:** Various, OBR **Identifier:** N/A

Comment: The current value for HRRPW is last period's value adjusted for the change in inflation, defined here by a small margin over the GDP deflator. Data for England and Wales is from Housing Rent Statistics (CIPFA); data for Scotland is from Scottish Housing Statistics.

Housing: Rent RPI (PRENT)

Model equation: Technical relationship

$$PRENT = PRENT(-1)*((0.6*(PCE/PCE(1))) + (0.16*(HRRPW/HRRPW(-1))) + (0.24*(PRP/PRP(-1)))) \quad (4.29)$$

Unit: Index **Source:** ONS **Identifier:** DOBP

Comment: The equation weights together local authority rents, private registered provider rents (both of which are decomposed into regional forecasts) and private rents. Private rents are assumed to grow in line with the consumers' expenditure deflator.

Private Registered Provider rents per house per week (PRP)

Model equation: Imposed variable

$$PRP = PRP(-1) \quad (4.30)$$

Unit: Index **Source:** DCLG **Identifier:** T703,T704 =DCLG

Comment: Private registered provider rents are decomposed into regional forecasts and aggregated to form the UK forecast.

Consumer prices index including owner occupiers housing(CPIH)

Model equation: Technical relationship

$$CPIH = I11*(((1 - W5)*(CPI/I10)) + (W5*(OOH/I12))) \quad (4.31)$$

Unit: Index **Source:** ONS **Identifier:** L522

Owner occupied housing (imputed rents for CPIH) (OOH)

Model equation: Imposed variable

$$OOH = OOH(-1) \quad (4.32)$$

Unit: Index **Source:** ONS **Identifier:** L5P5

Consumer Prices Index (CPI)

Model equation: Technical relationship

$$CPI = CPI(-1)*((1 - W1)*CPIX + W1*PRENT) /((1 - W1)*CPIX(-1) + W1*PRENT(-1)) \quad (4.33)$$

Unit: Index **Source:** ONS **Identifier:** D7BT

Comment: This equation specifies CPI as a function of rents and CPI excluding rents (CPIX), where CPI excluding rents is specified as a mark-up over unit costs.

The unit cost approach specified in this group should be seen as an alternative way to decompose and evaluate the CPI inflation forecast, rather than the central forecasting framework. More details of the OBR's approach to forecasting inflation can be found in OBR, 2011, *Forecasting the economy*.

RPI excluding Mortgage Interest Payments (PRXMIP)

Model equation: Technical relationship

$$PRXMIP = I9*(((1 - (W1 + W2 + W3*ifge(199501)))/(1 - W4))*RROSSI)/I8 + (W1*PRENT/I1 + W2*PCT/I2 + W3*HD/I3)/(1 - W4)) \quad (4.34)$$

Unit: Index **Source:** ONS **Identifier:** CHMK

Comment: Prior to 1987 the identifier for this variable is RYYW.

Housing: Mortgage Interest Payments RPI (PRMIPSVR)

Model equation: Behavioural equation

$$PRMIPSVR = (1.020*PRMIPSVR(-1)*RMORTMK)/(RMORTMK(-1)) \quad (4.35)$$

Unit: Index **Source:** ONS **Identifier:** DOBQ

Retail Prices Index (RPI)

Model equation: Technical relationship

$$RPI = ratio4(PR)*100 - 100 ; \quad (4.36)$$

Unit: Index **Source:** ONS **Identifier:** CHAW

where:

$$PR = I7*((1 - W4)*PRXMIP/I9 + W4*PRMIP/I4)$$

Comment: This equation weights together the components of the RPI. Weights are assumed to be fixed in the forecast. Prior to 1987 the identifier for this variable is FRAG.

GDP(E) deflators

AVI of exports of non-oil goods ex MTIC (PXNOX)

Model equation: Behavioural equation

$$\begin{aligned} dlog(PXNOX) = {} & - \underset{(3.8)}{0.12}*(log(PXNOX(-1)) - \underset{(4.4)}{0.56}*log(PPIY(-1)) \\ & - \underset{(-)}{(1 - 0.56)}*log(WPG(-1)/RXD(-1)) \\ & + \underset{(7.6)}{0.002}*time(197001)) + \underset{(30)}{0.84}*dlog(PPIY) \\ & + \underset{(-)}{(1 - 0.84)}*(dlog(WPG) - dlog(RXD)) \\ & + \underset{(4.0)}{0.04}*ifeq(199301) + \underset{(4.1)}{0.06} \end{aligned} \quad (4.37)$$

Unit: Index **Source:** ONS **Identifier:** (BQHP*1000 - ELBL)/(BQHR*1000 – BOXX)

Equation properties:

Estimation period: 1974Q2 to 2003Q3

$R^2 = 0.76$

Static long-run solution:

$$\log PXNOX = 0.56\log(PPIY) + (1 - 0.56)*\log(WPG/RXD) - 0.002T + 0.53$$

Elasticity of PXNOX with respect to a 1% increase in:

	Q1	Q5	Q9	Long-run
Domestic prices (PPIY)	0.84%	0.73%	0.66%	0.56%
World prices (WPG/RXD)	0.16%	0.27%	0.34%	0.44%

Comment: The AVI for exports of non-oil goods is determined by domestic producer output prices and the world price of non-oil goods. The former captures domestic cost pressures. The latter is weighted according to shares of world trade and converted into domestic currency using the dollar/sterling exchange rate. The static and dynamic homogeneity restrictions were easily accepted by the data.

AVI of exports of services (PXS)

Model equation: Technical relationship

$$ratio(PXS) = ratio(PXNOX) \qquad (4.38)$$

Unit: *Index* **Source:** *ONS* **Identifier:** *100*(IKBB/IKBE)*

AVI of imports of non-oil goods ex MTIC (PMNOX)

Model equation: Behavioural equation

$$
\begin{aligned}
dlog(PMNOX) = \; & -0.25*((log(PMNOX(-1)) \\
& \quad (5.9) \\
& -0.50*log(WPG(-1)/RXD(-1)) \\
& \quad (4.3) \\
& -(1-0.50)*log(PPIY(-1))) \\
& \quad (-) \\
& +0.003*(time(197001)-18)) \\
& \quad (14.4) \\
& +0.05*log(RCOM) \\
& \quad (3.6) \\
& +0.30*(dlog(WPG)-dlog(RXD)) \\
& \quad (8.9) \\
& +(1-0.30)*dlog(PPIY) \\
& \quad (-) \\
& +0.06*ifeq(197804) \\
& \quad (4.7) \\
& -0.07*ifeq(197903)+0.14 \\
& \quad (5.4)
\end{aligned}
\qquad (4.39)
$$

Unit: Index **Source:** ONS **Identifier:** 100*(BQHQ-ENXO)/(BQHS-BPIX)

where:

$$
RCOM = exp(-log(WPG) + 1.13*log(WPBM) + (1-1.13)*log(PBRENT))
$$

Equation properties:

Estimation period: 1974Q2 to 2003Q3

$R^2 = 0.666$

Static long-run solution:

$$
log\ PMNOX = 0.19(RCOM) + 0.5*log(PPIY) + 0.5*log(WPG/RXD) + 0.56
$$

Elasticity of PMNOX with respect to a 1% increase in:

	Q1	Q5	Q9	Long-run
Producer output prices (PPIY)	0.70%	0.56%	0.52%	0.5%
World prices (WPG/RXD)	0.30%	0.43%	0.48%	0.5%
World Price of Raw Materials (RCOM)	0.04%	0.14%	0.17%	0.19%

Comment: Prices are determined by domestic market conditions (proxied with PPIY), the world price of non-oil goods and the relative commodity intensity of UK imports (RCOM). A positive sign on RCOM indicates that the UK's manufactured imports use relatively more of that import, and a negative sign means they use less. Static and dynamic homogeneity are imposed.

AVI of imports of services (PMS)

Model equation: Technical relationship

ratio(PMS) = ratio(PMNOX) *(4.40)*

Unit: *Index* ***Source:*** *ONS* ***Identifier:*** *100*(IKBC/IKBF)*

Inventories deflator (PINV)

Model equation: Technical relationship

ratio(PINV) = ratio(PGDP) *(4.41)*

Unit: *Index* ***Source:*** *OBR* ***Identifier:*** *N/A*

Consumers' expenditure deflator (PCE)

Model equation: Technical relationship

ratio4(PCE) = ratio4(CPI) *(4.42)*

Unit: *Index* ***Source:*** *ONS* ***Identifier:*** *100*(RPQM/(ABJR+HAYO))*

Comment: Since 2011 the ONS has used CPI, rather than RPI, as the basis for the deflation of consumption in the National Accounts.

Investment deflator (PIF)

Model equation: Behavioural equation

$$
\begin{aligned}
dlog(PIF) = \; & -0.12*(log(PIF(-1)/ICOST(-1)) \\
& \quad (3.3) \\
& + 0.002*time(197001)) \\
& \quad (7.0) \\
& + 0.22*dlog(PIF(-2)) + 0.29*dlog(PIF(-4)) \\
& \quad (-) \qquad\qquad (-) \\
& + 0.27*dlog(ICOST) \\
& \quad (2.8) \\
& + (1 - 0.22 - 0.29 - 0.27)*dlog(ICOST(-1)) \\
& \qquad\quad (-) \\
& + 0.04 - 0.004*Q1 \\
& \quad (2.8) \quad (-1.9)
\end{aligned}
\qquad (4.43)
$$

Unit: *Index* ***Source:*** *ONS* ***Identifier:*** *100*(NPQS/NPQT)*

Equation properties:

Estimation period: 1980Q1 to 2002Q4

$R^2 = 0.56$ Normality $CHI^2_2 = 3.17$

Static long-run solution:

$$log\ PIF = log(ICOST) - 0.0021T + 0.29$$

Elasticity of PIF with respect to a 1% increase in:

	Q1	Q5	Q9	Long-run
Investment costs (ICOST)	0.27%	0.92%	1.18%	1.00%

Comment: The price of investment is assumed to be determined as a mark up over the gross cost index. The time trend may reflect productivity differentials.

The price of investment is relatively volatile and can be subject to large revisions. In practice the forecast of the investment deflator is informed its historical trends and the general outlook for inflation and import prices.

Consumer durables deflator (PCDUR)

Model equation: Technical relationship

$$ratio(PCDUR) = ratio(PMNOX) \quad (4.44)$$

Unit: Index **Source:** ONS **Identifier:** 100*(UTIB/UTID)

Interest Rate on Housing Finance (RHF)

Model equation: Technical relationship

$$RHF = RMORT - (1 - 0.25*TPBRZ)*(RMORT - RDEP)*(1 - 0.001*LHP/GPW) \quad (4.45)$$

Unit: Per cent **Source:** OBR **Identifier:** N/A

Comment: This specification reflects the interest costs of borrowing mortgage funds and the opportunity cost of housing equity.

The effective rate of return on alternative investments varies considerably, ranging from full taxation of conventional gilts to tax subsidies on savings for pensions. However, some evidence on effective rates of return suggested a differential of around 1/2 per cent on investments with an assumed nominal pre-tax return of 8 per cent per year. Thus the effective tax rate is 6.25 per cent or 0.25 times the basic rate. The proportion of mortgage borrowing in total housing finance is calculated in stock terms, i.e. the ratio of the stock of mortgage lending to gross physical wealth.

Owner occupancy rate (OWC)

Model equation: Imposed variable

$$OWC = OWC(-1) \quad (4.46)$$

Unit: Rate **Source:** DCLG **Identifier:** N/A

Average House Price (Feb'02=100) (APH)

Model equation: Imposed variable

APH = APH(-1) *(4.47)*

Unit: *Index* ***Source:*** *DCLG* ***Identifier:*** *N/A*

Comment: This variable represents the mix-adjusted average house price index, as reported in the ONS *House Price Index* release (previously published by the Department for Communities and Local Government). The forecast of house prices is based on the median expectations in the Treasury's Comparison of Independent Forecasts for year-end (Q4) annual inflation of those external organisations who forecast ONS house price inflation. This is used for the first two years of the forecast. Thereafter house prices are assumed to rise broadly in line with the long-term average rate of earnings growth.

Housing: Depreciation RPI (HD)

Model equation: Technical relationship

ratio(HD) = ratio(APH) *(4.48)*

Unit: *Index* ***Source:*** *ONS* ***Identifier:*** *CHOO*

Comment: Housing depreciation was introduced into the RPI in February 1995.

Market Sector GVA deflator (PMSGVA)

Model equation: Technical relationship

PMSGVA = 100(MSGVA£/MSGVA)* *(4.49)*

Unit: *Index* ***Source:*** *OBR* ***Identifier:*** *N/A*

5 Balance sheets and the income accounts

Financial accounts and balance sheets

This group contains equations describing the Financial Account and Financial Balance Sheet for the household sector, the external sector and PNFCs.

The Financial Account details flows (net acquisitions – 'purchases' or 'sales') of financial assets and liabilities for a particular institutional sector. Its balancing item (net lending) is equal in magnitude and opposite in sign to the balance of the Capital Account, subject to a statistical discrepancy.

The Financial Balance sheet records stocks of financial assets and liabilities for a particular sector. Changes in these stocks arise because of the flows recorded in the Financial Account, plus any revaluations from changes in assets prices, write-offs or other non-flow adjustments.

These accounting relationships are used to link income and expenditure by each sector through to acquisition of financial assets and liabilities, and then through to financial balance sheets.

The ordering is specific for each sector. For households, acquisition of financial assets is modelled explicitly as a function of other parts of the model (for example, pension flows to the labour market and deposits the housing market). Given the household financial balance, acquisition of liabilities is defined by the flow of funds constraint. The split between secured and unsecured financing then depends mainly on housing market variables.

For the external sector, acquisition of liabilities (which are capital outflows from the UK) are modelled directly, along with FDI flows in both directions. Combined with the financial balance, this leaves portfolio inflows as the residual financing item.

Financial balance sheets for PNFCs are more complex than for households, and less use is made of flow-of-funds constraints. Total acquisition of liabilities (financing) is related to nominal investment, and then simply split by existing

portfolio shares between instruments. Financial assets are treated as one aggregate.

Figure 5.1: Households balance sheet

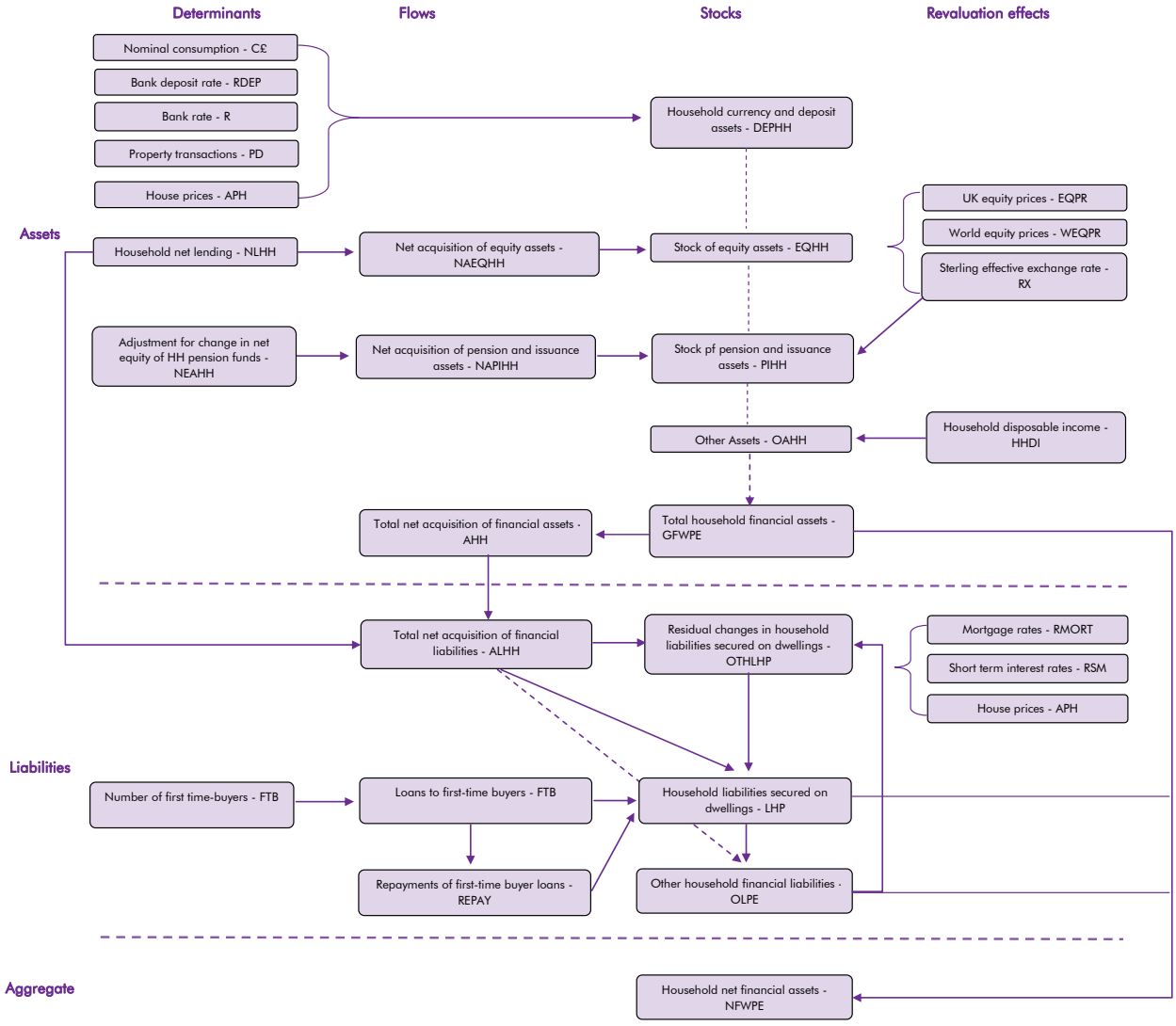


Figure 5.2: External balance sheet

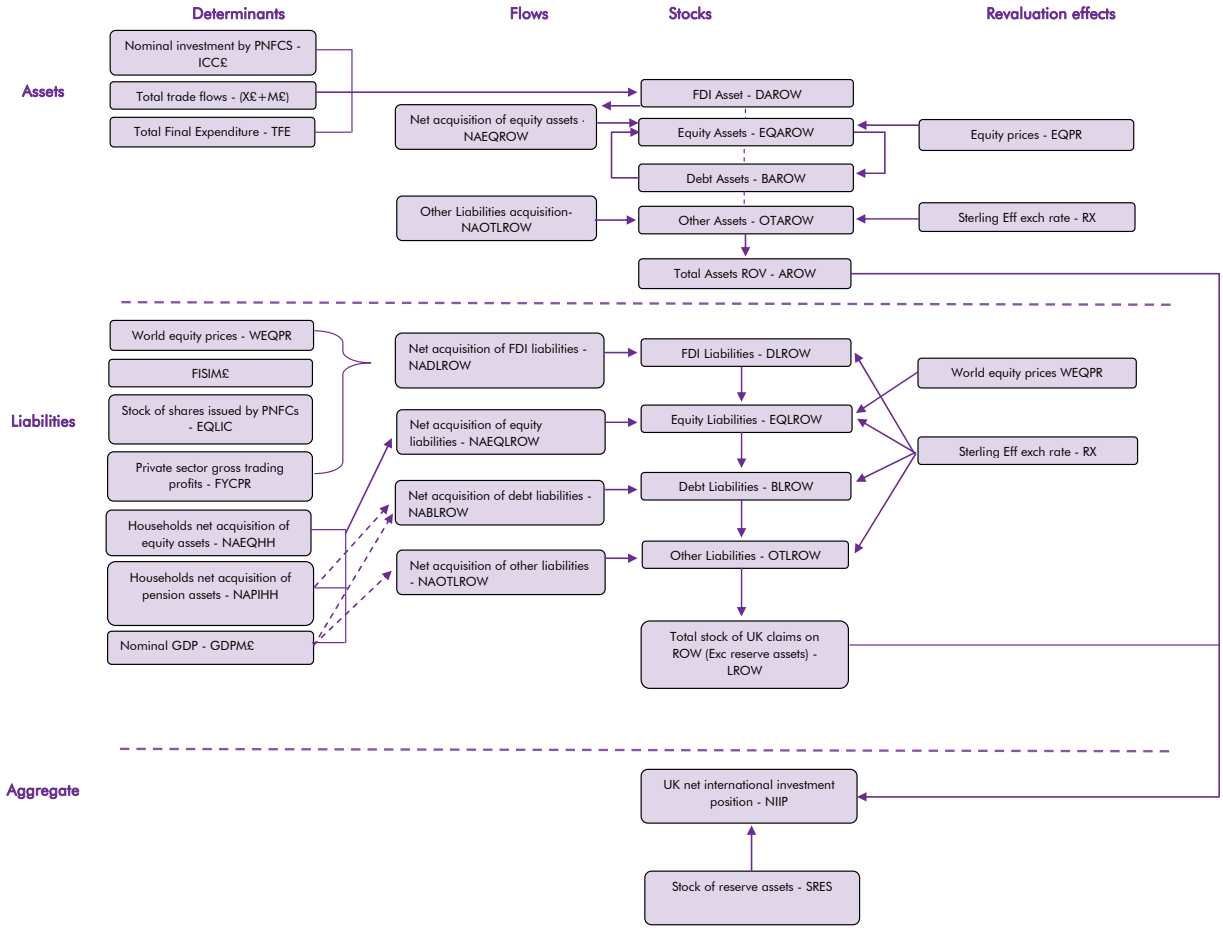
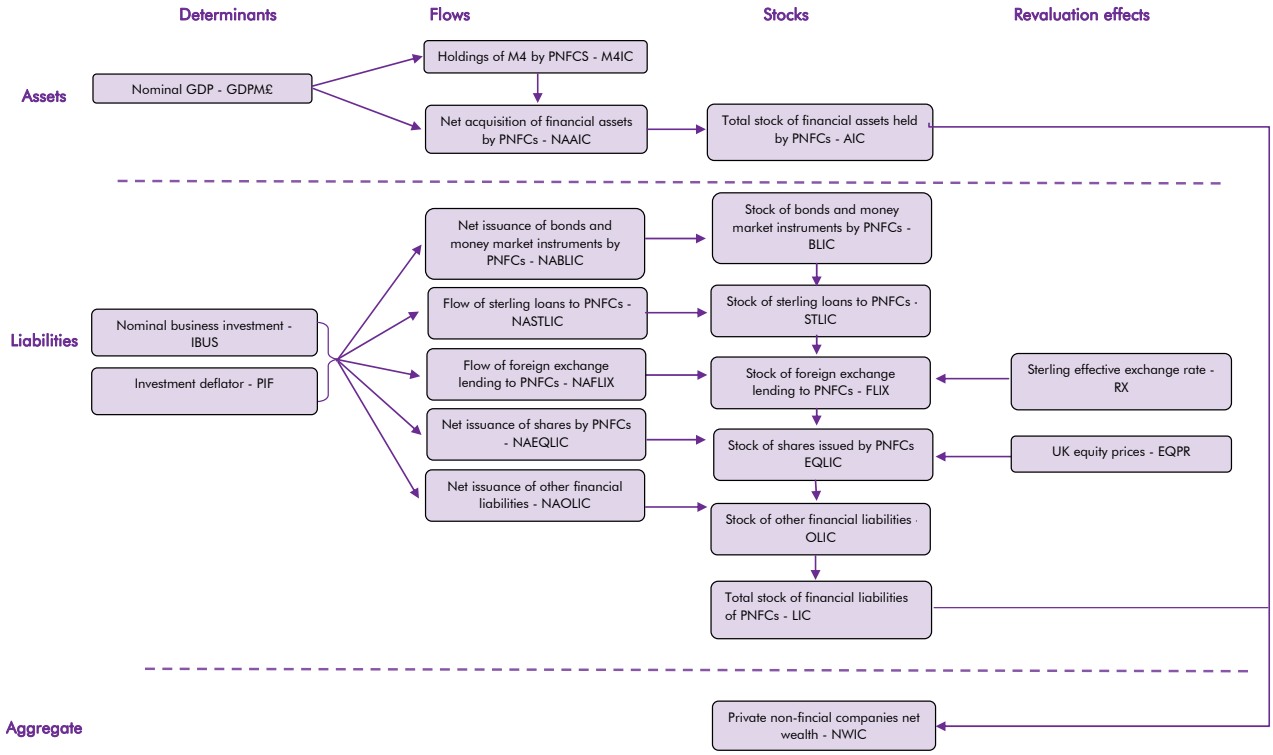


Figure 5.3: Corporate balance sheet



Households – financial assets

Net Lending (from capital a/c, NSA) (NAFHHNSA)

Model equation: Technical relationship (identity)

$$NAFHHNSA = NAFHH + NAFHH(-1) + NAFHH(-2) + NAFHH(-3) - NAFHHNSA(-1) - NAFHHNSA(-2) - NAFHHNSA(-3) \quad (5.1)$$

Unit: £m ***Source:*** ONS ***Identifier:*** NSSZ

Comment: This is the non-seasonally adjusted (NSA) version of NAFHH (Household sector net lending). The variable is de-seasonalised on the assumption that SA will equal to NSA over any four quarter period.

Statistical discrepancy: net lending (SDLHH)

Model equation: Technical relationship

$$SDLHH = 0 \qquad (5.2)$$

Unit: £m *Source:* ONS *Identifier:* NZDV

Comment: The statistical discrepancy between household net lending in the capital account and financial account is assumed to be zero in the forecast. The variable is included to aid coherency with the data.

Net lending (from financial a/c, NSA) (NLHH)

Model equation: Technical relationship (identity)

$$NLHH = NAFHHNSA - SDLHH \qquad (5.3)$$

Unit: £m *Source:* ONS *Identifier:* NZDY

Comment: Net lending in the financial account defines the balance between acquisition of financial assets and liabilities, and so provides the link saving and investment by the household sector with financial balance sheets.

Currency and deposit assets (DEPHH)[1]

Model equation: Behavioural equation

$$\begin{aligned} dlog(DEPHH) = {} & \underset{(0.000)}{0.44*dlog(C£)} + \underset{(0.001)}{0.02*(diff(RDEP) - diff(R))} \\ & + \underset{(0.000)}{0.34*GMF} - 0.03*(log(DEPHH(-1)) \\ & - \underset{(0.001)}{1.48*log(C£(-1))} - \underset{(0.000)}{0.04*RDEP(-1)} + \underset{(0.001)}{4.67} \end{aligned} \qquad (5.4)$$

Unit: £m *Source:* ONS *Identifier:* NNMP

where:

GMF = (PD*APH*0.858)/DEPHH(-1)

[1] Values in parentheses are p-values rather than t-statistics.

Comment: Holdings of cash and deposits by households are modelled as an error-correction process. In the long-run relationship, the stock of deposits depends on nominal consumption (as a proxy for transactions demand), retail deposit rates and a proxy (GMF) for the transaction demand that is generated by turnover in the housing market. It is possible that the above-unity coefficient on C£ reflects some influence on deposits that is not being captured by the variables. Deposit rates themselves had a weaker dynamic effect than the change in the deposit spread, whereas the level of the spread was not significant in the co-integrating relationship.

Equation properties:

Adjusted R-squared: 0.68

Static long-run solution:

$$log(DEPHH) = 1.48*log(C£) + 0.04*RDEP + 9.89*GMF + 4.67$$

Elasticity of DEPHH with respect to a 1% increase in:

	Q1	Q5	Q9	Long-run
Household nominal Consumption (C£)	0.49%	0.65%	0.79%	1.48%
Retail Deposit Spread (RDEP-R)	0.02%	0.01%	0.01%	0.0%
Retail Deposit Rate (RDEP)	0.002%	0.008%	0.01%	0.04%
Gross Mortgage Flow (APH*PD)	0.02%	0.05%	0.08%	0.22%

NB: the equation for DEPHH mixes logged and un-logged terms, meaning that elasticities depend on the level of GMF. The effects in the table are derived assuming 2012 average level for GMF.

Net acquisition of equity assets (NAEQHH)

Model equation: Behavioural equation

$$NAEQHH = 0.46*NLHH - 3681 \qquad (5.5)$$

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *NFXV*

Comment: This variable covers acquisition of equity assets held by households directly – rather than through pension funds. It was difficult to estimate a meaningful equation for NAEQHH. Variables such as unemployment (as a proxy for risk), existing equity assets as a share of total assets, interest rates and household dividend receipts relative to assets (a kind of inverse Price/Earnings ratio) were either incorrectly signed or added marginal partial correlation over net lending. Therefore, a very simple model is specified where NAEQHH is simply determined as a share of net lending.

Stock of equity assets (EQHH)

Model equation: Technical relationship

$$EQHH = (1 + 0.83*(EQPR/EQPR(-1) - 1) + 0.17*(ratio(WEQPR)/ratio(RX))*EQHH(-1) + NAEQHH \quad (5.6)$$

Unit: £m **Source:** ONS **Identifier:** NNOS

Comment: EQHH is the stock counterpart of the flow variable NAEQHH. Revaluation of EQHH is modelled as a function of domestic and foreign equity prices, with the coefficients based on portfolio shares.

Net acquisition of pension and insurance assets (NAPIHH)[2]

Model equation: Behavioural equation

$$NAPIHH = \underset{(0.43)}{2402} + \underset{(0.037)}{1.24}*diff(NEAHH) + \underset{(0.36)}{0.23}*NAPIHH(-1) + \underset{(0.028)}{0.93}*NEAHH(-1) \quad (5.7)$$

Unit: £m **Source:** ONS **Identifier:** NPWX

Comment: As NAPIHH measures net inflows it is conceptually similar to NEAHH. The correlation is not perfect as NAPIHH also includes lump-sum withdrawals from schemes as well as ongoing flows of contributions and pensions disbursements. Since 2008 the relationship has broken down.

[2] Values in parentheses are p-values rather than t-statistics

Equation properties:

R-squared: 0.26

Static long-run solution: $NAPIHH = 3116 + 1.21*NEAHH$

Elasticity of DEPHH with respect to a 1% increase in:

	Q1	Q5	Q9	Long-run
Change in net equity of HH pension funds (NEAHH)	1.21%	1.21%	1.21%	1.21%

Stock of pension and insurance assets (PIHH)

Model equation: Technical relationship

$$PIHH = (1 + 0.31*((ratio(EQPR) - 1) + 0.17*(RX/RX(-1) - 1) + 0.16*(ratio(WEQPR)/ratio(RX) - 1)*PIHH(-1) + NAPIHH \quad (5.8)$$

Unit: £m ***Source:*** ONS ***Identifier:*** NPYL

Comment: PIHH is the stock counterpart of the flow variable NAPIHH. Revaluation of PIHH is modelled as a function of domestic and foreign equity prices, with the coefficients based on portfolio shares.

Other financial assets (OAHH)

Model equation: Technical relationship

$$ratio(OAHH) = ratio(HHDI) - 0.03 \quad (5.9)$$

Unit: £m ***Source:*** ONS ***Identifier:*** NNMY+NNOA+NNPM

Comment: Other financial assets are assumed to grow in line with income, less an adjustment.

Total net acquisition of financial assets (AAHH)

Model equation: Technical relationship (identity)

$$AAHH = diff(DEPHH) + NAEQHH + NAPIHH + diff(OAHH) \quad (5.10)$$

Unit: £m **Source:** ONS **Identifier:** NFVO

Total household financial assets (GFWPE)

Model equation: Technical relationship (identity)

$$GFWPE = DEPHH + EQHH + PIHH + OAHH \quad (5.11)$$

Unit: £m **Source:** ONS **Identifier:** NNML

Households – financial liabilities

Total net acquisition of financial liabilities (ALHH)

Model equation: Technical relationship (identity)

$$ALHH = AAHH - NLHH \quad (5.12)$$

Unit: £m **Source:** ONS **Identifier:** NFYS

Comment: This equation is a flow-of-funds constraint, based on inverting the accounting relationship that the net acquisition of financial assets by any given sector must be funded by the net creation of financial liabilities or by net lending (a financial surplus).

Stock of loans to households secured on dwellings (LHP)

Model equation: Imposed variable

$$LHP = LHP(-1) \quad (5.13)$$

Unit: £m **Source:** ONS **Identifier:** NNRP

Stock of other households financial liabilities (OLPE)

Model equation: Technical relationship (identity)

$$diff(OLPE) = ALHH - diff(LHP) \quad (5.14)$$

Unit: £m **Source:** ONS **Identifier:** NNPP-NNRP

Comment: This variable includes unsecured credit (credit cards, store cards and personal loans) extended to households, but also some imputed stocks – 'Other Accounts Receivable and Payable'.

Households – financial aggregates

Stock of net financial wealth (NFWPE)

Model equation: Technical relationship (identity)

$$NFWPE = GFWPE - LHP - OLPE \quad (5.15)$$

Unit: £m **Source:** ONS **Identifier:** NZEA

Stock of physical wealth (GPW)

Model equation: Technical relationship

$$GPW = 0.99*GPW(-1)*APH/APH(-1) + 0.001*IHH£ \quad (5.16)$$

Unit: £m **Source:** ONS **Identifier:** CGRI+CGRK+CGRL+CGRN+CGRM+CGRJ+CGRS+CGRO

Comment: Household physical wealth in nominal terms consists overwhelmingly of dwellings. The below unity coefficient on GPW(-1) is consistent with an annual rate of depreciation of 2.7 per cent of the real value of the existing stock of housing. The term in house prices represents the nominal revaluation effect of house prices, IHH£ is acquisition of housing from other sectors – either newly built or existing dwellings.

Rest of the World – financial assets

Net Lending (from capital a/c NSA) (NAFROWNSA)

Model equation: Technical relationship (identity)

$$NAFROWNSA = NAFROW + NAFROW(-1) + NAFROW(-2) + NAFROW(-3) - NAFROWNSA(-1) - NAFROWNSA(-2) - NAFROWNSA(-3) \quad (5.17)$$

Unit: £m **Source:** ONS **Identifier:** NHRB

Comment: See comment to NAFHHNSA.

Statistical discrepancy: net lending (SDLROW)

Model equation: Technical relationship

$$SDLROW = 0 \quad (5.18)$$

Unit: £m **Source:** ONS **Identifier:** NYPO

Comment: See comment to SDLHH.

Net lending (from financial a/c, NSA) (NLROW)

Model equation: Technical relationship (identity)

$$NLROW = NAFROWNSA - SDLROW \quad (5.19)$$

Unit: £m **Source:** ONS **Identifier:** NYOD

Comment: Net lending in the financial account defines the balance between acquisition of financial assets and liabilities for the Rest of the World vis-a-vis the UK. A positive figure indicates that the ROW is acquiring net claims on the UK.

Total acquisition of ROW claims on UK (AAROW)

Model equation: Technical relationship (identity)

$$AAROW = ALROW + NLROW \quad (5.20)$$

Unit: £m **Source:** ONS **Identifier:** HBNS

Comment: This equation is a flow-of-funds constraint: the net acquisition of financial assets (by any given sector) must be funded by the net creation of financial liabilities or by net lending (a financial surplus). This applies for the external sector vis-a-vis the UK as a whole, as it does for sectors within the UK.

Stock of ROW direct claims on UK (DAROW)[3]

Model equation: Behavioural equation

$$diff(DAROW) = TFE£*(0.38*(X£ + M£)/TFE£ + 0.71*ICC£/TFE£ - 0.19) \quad (5.21)$$

(0.028) (0.002) (0.005)

Unit: £m **Source:** ONS **Identifier:** HBWI

Comment: Inflows of FDI to the UK are difficult to model. The relative return variables that appear to have some explanatory value for outflows (see NADLROW) were incorrectly signed in most specifications. The equation models acquisition of direct investment assets relative to Total Final Expenditure as a function of the intensity of trade and investment in Total Final Expenditure, as broad proxies for the openness of the UK.

Acquisition of portfolio equity claims on UK by ROW (NAEQAROW)

Model equation: Technical relationship

$$\begin{aligned} NAEQAROW = {} & (EQAROW(-1) + EQAROW(-2) \\ & + EQAROW(-3) + EQAROW(-4))/ \\ & (EQAROW(-1) + EQAROW(-2) \\ & + EQAROW(-3 + EQAROW(-4) \\ & + BAROW(-1) + BAROW(-2) \\ & + BAROW(-3) + BAROW(-4))* \\ & (AAROW - diff(DAROW) - NAOTAROW) \end{aligned} \quad (5.22)$$

Unit: £m **Source:** ONS **Identifier:** XBLW

Comment: Portfolio inflows are set as the residual in the balance of payments financial account. The shares of inflows into equities and bonds are set proportional to recent stocks.

[3] Values in parentheses are p-values rather than t-statistics.

Stock of portfolio equity claims on UK by ROW (EQAROW)

Model equation: technical relationship

$$EQAROW = EQAROW(-1)*ratio(EQPR) + NAEQAROW \quad (5.23)$$

Unit: £m **Source:** ONS **Identifier:** HLXX

Comment: The stock of portfolio equity is assumed to revalue in line with the FTSE All-share index.

Acquisition of portfolio debt claims on UK by ROW (NABAROW)

Model equation: Technical relationship

$$\begin{aligned} NABAROW = {} & (BAROW(-1) + BAROW(-2) + BAROW(-3) \\ & + BAROW(-4))/(EQAROW(-1) \\ & + EQAROW(-2) + EQAROW(-3) \\ & + EQAROW(-4) + BAROW(-1) \\ & + BAROW(-2) + BAROW(-3) \\ & + BAROW(-4))*(AAROW - diff(DAROW) \\ & - NAOTAROW) \end{aligned} \quad (5.24)$$

Unit: £m **Source:** ONS **Identifier:** XBLX

Comment: See comment for NAEQAROW.

Stock of portfolio debt claims on UK by ROW (BAROW)

Model equation: technical relationship

$$BAROW = BAROW(-1)*((1-0.4)/ratio(RX) + 0.4) + NABAROW \quad (5.25)$$

Unit: £m **Source:** ONS **Identifier:** HLXY

Comment: 40 per cent of the stock of portfolio debt is assumed to be denominated in foreign currency. 40 per cent is based on comparing the stock-flow adjustment residual (ΔBAROW – NABAROW) against movements in the sterling ERI.

Acquisition of Other claims on UK by ROW (NAOTAROW)

Model equation: Technical relationship

$$NAOTAROW = NAOTLROW \quad (5.26)$$

Unit: £m **Source:** ONS **Identifier:** XBMN

Comment: 'Other' assets consist mainly of interbank lending, mostly short maturity exposures. These are closely correlated between assets and liabilities, so inflows are assumed to be equal to outflows.

Stock of Other debt claims on UK by ROW (OTAROW)

Model equation: Technical relationship

$$OTAROW = OTAROW(-1)*(0.85/ratio(RX) + (1-0.85)) + NAOTAROW \quad (5.27)$$

Unit: £m **Source:** ONS **Identifier:** HLYD

Comment: 85 per cent of the stock of other assets is assumed to be denominated in foreign currency. This proportion is based on BoE Bankstats data.

Total stock of claims on UK by ROW (AROW)

Model equation: Technical relationship (identity)

$$AROW = DAROW + EQAROW + BAROW + OTAROW \quad (5.28)$$

Unit: £m **Source:** ONS **Identifier:** HBQB-JX97

Comment: The definition of UK external liabilities excludes financial derivatives, which have a very short run of data and which do not generate income in the current account.

Rest of the World – financial liabilities[4]

Acquisition of UK FDI claims on ROW (NADLROW)

Model equation: Behavioural equation

$$NADLROW = DLROW(-1)*(-0.04 - 0.21*DLROW(-1)/LROW(-1) \quad (5.29)$$
$$\underset{(0.547)}{} \quad \underset{(0.037)}{}$$
$$- 0.20*(FYCPR(-1) + FISIM£(-1))/EQLIC$$
$$\underset{(0.673)}{}$$
$$+ 0.10*ratio(WEQPR)$$
$$\underset{(0.037)}{}$$

Unit: £m ***Source:*** ONS ***Identifier:*** -HJYP

Comment: The equation for outward flows FDI models acquisition, relative to the existing stock, as a function of the FDI share of total UK claims on ROW (effectively an error-correction term), a proxy for the domestic return on equity, and a proxy for the foreign return on equity. In estimation a dummy variable was included taking the values 1 in 1998Q4, 1999Q2 and 2000Q1, where there are very large spikes in FDI flows, which may be related to large single merger or acquisition deals.

Stock of UK FDI claims on ROW (DLROW)

Model equation: Technical relationship

$$DLROW = DLROW(-1)/ratio(RX) + NADLROW \quad (5.30)$$

Unit: £m ***Source:*** ONS ***Identifier:*** HBWD

Comment: The stock of portfolio equity is assumed to be recorded at book value in foreign currency.

Acquisition of portfolio equity claims on ROW by UK (NAEQLROW)

Model equation: Technical relationship

$$NAEQLROW = 0.20*NAPIHH + 0.13*NAEQHH + 0.003*GDPM£ \quad (5.31)$$

Unit: £m ***Source:*** ONS ***Identifier:*** -HBVI

[4] Values in parentheses are p-values rather than t-statistics.

Comment: NAEQLROW is modelled using household acquisition of equity and pension assets. Together the household and pension sectors account for over 70 per cent of UK portfolio holdings of foreign equities. Coefficients are based on existing portfolio shares.

Stock of portfolio equity claims on ROW by UK (EQLROW)

Model equation: Technical relationship

$$EQLROW = (EQLROW(-1)*(ratio(WEQPR/ratio(RX)) + NAEQLROW \quad (5.32)$$

Unit: £m **Source:** ONS **Identifier:** HLXX

Acquisition of portfolio debt claims on ROW by UK (NABLROW)

Model equation: Technical relationship

$$NABLROW = 0.17*NAPIHH + 0.003*GDPM£ \quad (5.33)$$

Unit: £m **Source:** ONS **Identifier:** HHZX

Comment: NABLROW is modelled in a similar way to NAEQLROW. Pension funds account for around 30 per cent of holdings of foreign bonds; historically, residual acquisition has averaged around 3.3 per cent of quarterly GDP.

Stock of portfolio debt claims on ROW by UK (BLROW)

Model equation: Technical relationship

$$BLROW = BLROW(-1)/ratio(RX) + NABLROW \quad (5.34)$$

Unit: £m **Source:** ONS **Identifier:** -XBMW

Acquisition of other claims on ROW by UK (NAOTLROW)

Model equation: Technical relationship

$$NAOTLROW = OTLROW(-1)*(ratio(GDPM£) - 1) \quad (5.35)$$

Unit: £m **Source:** ONS **Identifier:** -XBMM

Comment: Other investment flows are likely to relate heavily to international financial sector activity, and changes in the appetite of the international banking system for leverage which are very difficult to predict. For this reason, the model

equation operates on a simple, default assumption that means that, in the absence of revaluations, the stock of other assets grows at the same rate as GDP.

Stock of other claims on ROW by UK (OTLROW)

Model equation: Technical relationship

$$OTLROW = OTLROW(-1)*(0.90/ratio(RX) + (1-0.9)) + NAOTLROW \quad (5.36)$$

Unit: £m **Source:** ONS **Identifier:** -XBMW

Comment: 90 per cent of the stock of other assets is assumed to be denominated in foreign currency. This proportion is based on BoE Bankstats data.

Total acquisition of UK claims on ROW (ALROW)

Model equation: Technical relationship (identity)

$$ALROW = NADLROW + NAEQLROW + NABLROW + NAOTLROW - DRES \quad (5.37)$$

Unit: £m **Source:** ONS **Identifier:** -HBNR

Total stock of UK claims on ROW ex reserve assets (LROW)

Model equation: Technical relationship (identity)

$$LROW = DLROW + EQLROW + BLROW + OTLROW \quad (5.38)$$

Unit: £m **Source:** ONS **Identifier:** HBQA-LTEB-JX96

Comment: The definition of UK external liabilities excludes financial derivatives, which have a very short run of data and which do not generate income in the current account.

UK Net International Investment Position (NIIP)

Model equation: Technical relationship (identity)

$$diff(NIIP) = diff(LROW) + diff(SRES) - diff(AROW) \quad (5.39)$$

Unit: £m **Source:** ONS **Identifier:** HBQC

Comment: NIIP is projected in differences, which is equivalent to assuming that the net derivatives position stays constant at the last data point.

PNFCs – financial assets

Net acquisition of financial assets by PNFCs (NAAIC)

Model equation: Technical relationship

$$NAAIC = AIC(-1)*(ratio(GDPM£) - 1) \quad (5.40)$$

Unit: £m *Source:* ONS *Identifier:* NEQA

Stock of financial assets held by PNFCs (AIC)

Model equation: Technical relationship (identity)

$$AIC = AIC(-1) + NAAIC - diff(M4IC) \quad (5.41)$$

Unit: £m *Source:* ONS *Identifier:* NKWX

Comment: acquisition of M4 deposits by PNFCs is removed to prevent double counting.

PNFC Net Financial Wealth (NWIC)

Model equation: Technical relationship (identity)

$$NWIC = AIC - LIC \quad (5.42)$$

Unit: £m *Source:* ONS *Identifier:* NYOT

PNFCs – financial liabilities

Net issuance of bonds and MMIs by PNFCs (NABLIC)

Model equation: Technical relationship

$$NABLIC = 0.14*NALIC \quad (5.43)$$

Unit: £m *Source:* ONS *Identifier:* NETR

Comment: PNFC funding from each type of financial instrument is assumed to be proportional to the share of that instrument in the existing stock of liabilities.

Stock of bonds and MMIs held by PNFCs (BLIC)

Model equation: Technical relationship (identity)

$$BLIC = BLIC(-1) + NABLIC \quad (5.44)$$

Unit: £m **Source:** ONS **Identifier:** NKZA

Flow of foreign currency lending to PNFCs (NAFXLIC)

Model equation: Technical relationship

$$NAFXLIC = 0.07*NALIC \quad (5.45)$$

Unit: £m **Source:** ONS **Identifier:** NEUX+NEUZ

Comment: PNFC funding from each type of financial instrument is assumed to be proportional to the share of that instrument in the existing stock of liabilities.

Stock of foreign currency lending to PNFCs (FXLIC)

Model equation: Technical relationship

$$FXLIC = FXLIC(-1)*(RX(-1)/RX) + NAFXLIC \quad (5.46)$$

Unit: £m **Source:** ONS **Identifier:** NLBG+NLBI

Comment: FXLIC includes foreign currency denominated lending to UK PNFCs by UK MFIs, and lending to UK PNFCs by overseas MFIs (which is assumed to be denominated in foreign currency).

Stock of sterling lending to PNFCs (STLIC)

Model equation: Technical relationship

$$STLIC = STLIC(-1) + 0.09*NALIC \quad (5.47)$$

Unit: £m **Source:** ONS **Identifier:** NLBE-NLBG

Comment: FXLIC includes foreign currency denominated lending to UK PNFCs by UK MFIs, and lending to UK PNFCs by overseas MFIs (which is assumed to be denominated in foreign currency).

Net flow of equity issuance by PNFCs (NAEQLIC)[5]

Model equation: Technical relationship

$$NAEQLIC = \underset{(0.1165)}{\underset{(0.000)}{(1.60 + 0.94*PER(-1))*(FYCPR+FISIM£)}} - EQLIC(-1)*ratio(GDPM) \quad (5.48)$$

Unit: £m **Source:** ONS **Identifier:** NEVL

$$PER = EQLIC/(FYCPR+FISIM£)$$

Comment: The reported diagnostics are for an AR(1) equation in a National Accounts measure of the aggregate price/earnings ratio (PER). This equation can be transformed into an expression for NAEQLIC by writing the law of motion for EQLIC, with the assumption that equity prices grow in line with nominal GDP.

Stock of equity liabilities of PNFCs (EQLIC)

Model equation: Technical relationship

$$EQLIC = EQLIC(-1)*EQPR/EQPR(-1) + NAEQLIC \quad (5.49)$$

Unit: £m **Source:** ONS **Identifier:** NLBU

Stock of PNFC other financial liabilities (OLIC)

Model equation: Technical relationship

$$OLIC = OLIC(-1) + 0.04*NALIC \quad (5.50)$$

Unit: £m **Source:** ONS **Identifier:** NLCO+(NLBC-NLBE-NLBI)

Total net acquisition of financial liabilities by PNFCs (NALIC)[6]

Model equation: Behavioural equation

$$NALIC = \underset{(0.0007)}{\underset{(0.45976)}{1.51*IBUS*(PIF/100) - 27362}} \quad (5.51)$$

Unit: £m **Source:** ONS **Identifier:** NETE

[5] Values in parentheses are p-values rather than t-statistics

[6] Values in parentheses are p-values rather than t-statistics

Comment: PNFCs' total financing requirements are assumed to be related to a proxy for total nominal business investment. The above-unity coefficient is consistent with demand for financing financial asset purchases being correlated with the physical investment cycle.

Total stock of PNFC financial liabilities (LIC)

Model equation: Technical relationship (identity)

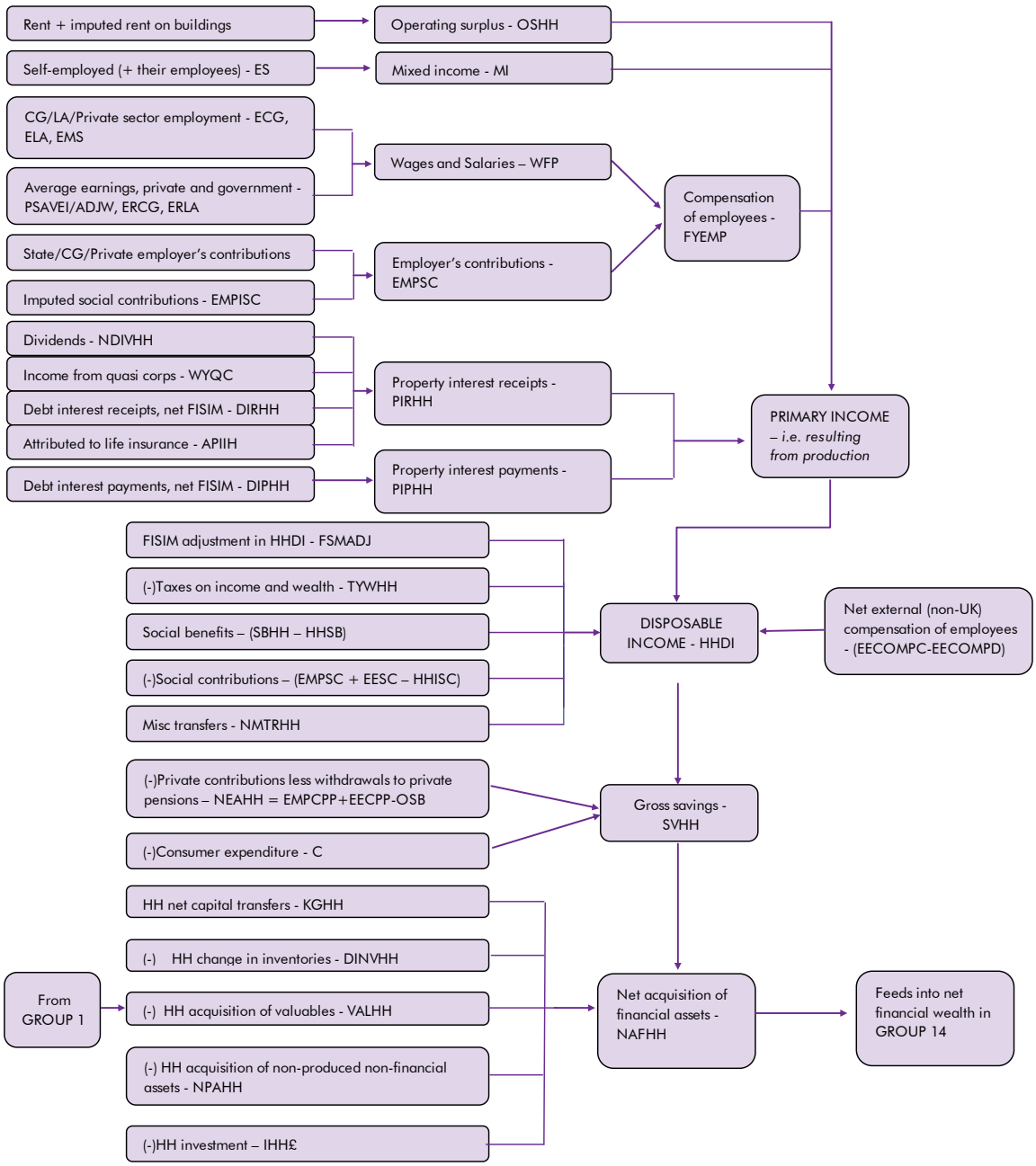
$$LIC = BLIC + STLIC + FXLIC + EQLIC + OLIC \quad (5.52)$$

Unit: £m ***Source:*** ONS ***Identifier:*** NLBB

The income account

This group contains equations that determine household income, including: income from employment, self-employment, dividend receipts and net interest receipts. Household sector saving is then obtained by identity, given total house expenditure in nominal terms, household disposable income and net equity withdrawal from pension and life assurance funds. Company sector saving and net acquisition of financial assets are then obtained as a residual, given other sectors' financial balances.

Figure 5.4: The income account



Wages and salaries (inc. benefits in kind) (WFP)

Model equation: Technical relationship

$$WFP = ADJW*PSAVEI*(EMS-ESLFS) + (52/4000)*CGWADJ*ERCG*ECG + (52/4000)*LAWADJ*ERLA*ELA \quad (5.53)$$

Unit: £m **Source:** ONS **Identifier:** DTWM-ROYK

Comment: This is total wage bill of the private sector and central and local government. WFP is the largest component of both compensation of employees (FYEMP) and household disposable income (HHDI).

Mixed income (MI)

Model equation: Technical relationship

$$ratio(MI) = ratio(WFP) \quad (5.54)$$

Unit: £m **Source:** ONS **Identifier:** DTWM-ROYK

Comment: Mixed income is so called because it includes both labour and capital income from self-employment. It covers sole traders but excludes partnership income that is included in profits under ESA95 – see variable WYQC. The forecasting equation grows mixed income in line with wages and salaries.

Employers' social contributions (EMPSC)

Model equation: Technical relationship (identity)

$$EMPSC = EMPISC + CGASC + EMPNIC + EMPCPP \quad (5.55)$$

Unit: £m **Source:** ONS **Identifier:** ROYK

Comment: Covers all employers' social contributions including imputed contributions and contributions to pension schemes.

Compensation of employees (FYEMP)

Model equation: Technical relationship (identity)

$$FYEMP = WFP + EMPSC \quad (5.56)$$

Unit: £m **Source:** ONS **Identifier:** DTWM

Comment: Total compensation of employees is the sum of the wage and salary bill and all employers' social contributions, including imputed contributions.

Employers' imputed social contributions (EMPISC)

Model equation: Technical relationship

$$EMPISC = HHISC + LASC + CGISC + 0.0086*WFP \quad (5.57)$$

Unit: £m **Source:** ONS **Identifier:** NQDK

Comment: Imputed employer's social contributions by all sectors. These are the counterpart to unfunded social benefits, paid directly by employers to employees or former employees. Because we do not forecast all sectors' imputed social contributions, we include an adjustment in our forecast based on wages and salaries (WFP) – the last term in the equation above.

Household imputed social contributions (HHISC)

Model equation: Technical relationship

$$ratio(HHISC) = ratio(WFP) \quad (5.58)$$

Unit: £m **Source:** ONS **Identifier:** RVFH

Comment: Imputed social contributions are the counterpart to unfunded social benefits, paid directly by employers to employees or former employees. This equation grows HHISC in line with wages and salaries (WFP) in the forecast.

Household social benefits (use) (HHSB)

Model equation: Technical relationship

$$HHSB = 2*HHISC \quad (5.59)$$

Unit: £m **Source:** ONS **Identifier:** QWMZ

Comment: Grows in line with household impute social contributions (HHISC) over the forecast period.

Household private funded social benefits (OSB)

Model equation: Technical relationship

$$ratio(OSB) = ratio(PCE)*ratio(GAD3) \quad (5.60)$$

Unit: £m **Source:** ONS **Identifier:** HAYR

Comment: Grows in line with the household and NPISH consumption expenditure deflator (PCE) and the pension-age population (GAD3).

Household social benefits (resource) (SBHH)

Model equation: Technical relationship (identity)

$$SBHH = EMPISC + OSB + (HHSB - HHISC) + CGSB + LASBHH + EESCLA + EESCCG + CGASC - BENAB \quad (5.61)$$

Unit: £m **Source:** ONS **Identifier:** RPHL

Household current taxes on income and wealth (TYWHH)

Model equation: Technical relationship (identity)

$$TYWHH = TYEM + TSEOP + CC + CGT + OCT - NPISHTC \quad (5.62)$$

Unit: £m **Source:** ONS **Identifier:** RPHS+RPHT

Net miscellaneous transfer receipts of households (NMTRHH)

Model equation: Technical relationship (identity)

$$NMTRHH = LAOTRHH + (CGOTR-HHTCG) + (HHTFA-HHTA) + (EUSF-GNP4) + 100 \quad (5.63)$$

Unit: £m **Source:** ONS **Identifier:** RPHO-RPID

Total interest payments of households (&NPISH), excluding FISIM adjustments (DIPHHx)

Model equation: Technical relationship (identity)

$$DIPHHx = DIPHH + DIPHHmf + DIPHHuf \quad (5.64)$$

Unit: £m **Source:** ONS **Identifier:** J4X3

Comment: The sum of FISIM-adjusted total interest payments (DIPHH) and the FISIM adjustment (DIPHHmf + DIPHHuf); effectively, the cash value of household interest payments.

Total interest payments of households (&NPISH): mortgage FISIM (DIPHHmf)

Model equation: Technical relationship

$$DIPHHmf = LHP(-1)*((1 + (RMORT - R)/100)\hat{}0.25 - 1) \quad (5.65)$$

Unit: £m **Source:** OBR **Identifier:** N/A

Comment: This variable estimates and forecasts the FISIM component of households' mortgage payments, using the spread between the effective average mortgage rate and Bank Rate and the stock of household mortgage debt.

Total interest payments of households (&NPISH): unsecured debt FISIM (DIPHHuf)

Model equation: Technical relationship

$$DIPHHuf = OLPE(-1)*((1 + (RS + 6.5 - R)/100)\hat{}0.25 - 1) \quad (5.66)$$

Unit: £m **Source:** OBR **Identifier:** N/A

Comment: This variable estimates and forecasts the FISIM component of households' unsecured debt payments, using the spread between an effective average unsecured borrowing interest rate (assumed short-term interbank rate + 650bp) and Bank Rate and the stock of household unsecured debt.

FISIM adjustment in household disposable income (FSMADJ)

Model equation: Technical relationship (identity)

$$FSMADJ = ifge(201203)*(DIRHHf - DIRHHf(201203) + DIPHHuf - DIPHHuf(201203)) \quad (5.67)$$

Unit: £m **Source:** OBR **Identifier:** N/A

Comment: This variable sums the total additional FISIM adjustment in household disposable income from the latest quarter of data, which is distributed between interest receipts and payments. This adjustment – which equals zero in the data –

is necessary to ensure that changes in interest rate spreads on deposits and unsecured lending have the correct direct effect upon household saving.

Total interest payments of HH (&NPISH) (DIPHH)

Model equation: Technical relationship

$$DIPHH = (LHP(-1) + OLPE(-1))*((1 + (0.9*R + 0.2)/100)\ \hat{}\ 0.25 - 1) \quad (5.68)$$

Unit: £m **Source:** ONS **Identifier:** ROYU

Comment: This is total FISIM-adjusted interest payments of households. The forecast uses a fixed share of Bank Rate and spread to simulate a FISIM reference rate (the pure cost of borrowing funds), and the previous period's total household liabilities.

Total interest receipts of HH (&NPISH) excluding FISIM adjustment (DIRHHx)

Model equation: Technical relationship (identity)

$$DIRHHx = DIRHH - DIRHHf \quad (5.69)$$

Unit: £m **Source:** ONS **Identifier:** J4X2

Comment: The difference between FISIM-adjusted total interest receipts (DIRHH) and the FISIM adjustment (DIRHHf); effectively, the cash value of interest receipts.

Total interest receipts of HH (&NPISH), FISIM component (DIRHHf)

Model equation: Technical relationship

$$DIRHHf = -(0.75*DEPHH(-1)*((1 + (RDEP - R)/100)\ \hat{}\ 0.25 - 1)) \quad (5.70)$$

Unit: £m **Source:** ONS **Identifier:** IV8W

Comment: The FISIM component of household interest receipts. In the forecast period this is calculated as the spread between average effective deposit rates (RDEP) and Bank Rate (R), multiplied by the stock of deposits and an adjustment factor (to reflect the more complex FISIM calculation used in the ONS data).

Total interest receipts of HH (&NPISH) (DIRHH)

Model equation: Technical relationship

$$DIRHH = DEPHH(-1)*((1 + R/100)\hat{}0.25 - 1) + DIPNSC + 0.02*DIPLDC + 0.01*CIPD + 11137*(RS/400) \quad (5.71)$$

Unit: £m **Source:** ONS **Identifier:** ROYM

Comment: This is total FISIM-adjusted interest receipts of households. The forecast includes FISIM-adjusted interest from deposits, using Bank Rate as a FISIM reference rate (the pure cost of funds) and the previous period's stock of deposits (DEPHH); interest from national savings (DIPNSC); a share of interest paid on conventional gilts (DIPLDC); a share of income from overseas assets (CIPD); and income from holdings of money market instruments and non-government, non-bank bonds.

Total interest receipts of PNFCs, excluding FISIM adjustment (DIRICx)

Model equation: Technical relationship (identity)

$$DIRICx = DIRIC - DIRICf \quad (5.72)$$

Unit: £m **Source:** ONS **Identifier:** I6PB

Comment: The difference between FISIM-adjusted interest receipts (DIRIC) and the FISIM adjustment (DIRICf); effectively, the cash value of interest receipts.

Total interest receipts of PNFCs, FISIM component (DIRICf)

Model equation: Technical relationship

$$DIRICf = -((2.75)*M4IC(-1)*(((1 + (0.9*R - 0.2 - R)/100)\hat{}.25) - 1)) \quad (5.73)$$

Unit: £m **Source:** ONS **Identifier:** IV87

Comment: The FISIM component of PNFC interest receipts. This is forecast as a fixed spread beneath Bank Rate (R), multiplied by the stock of PNFC MFI deposits (estimated as a multiple of M4IC, to reflect deposits in foreign currency and with non-UK banks).

Total interest receipts of PNFCs, including FISIM adjustment (DIRIC)

Model equation: Technical relationship

$$DIRIC = M4IC(-1)*(((1 + R/100) \hat{} 0.25) - 1) + M4IC(-1)*1.75*(((1 + (ROSHT+0.2)/100) \hat{} 0.25) - 1) + M4IC(-1)*0.35*(((1 + (RS+0.2)/100) \hat{} 0.25) - 1) \quad (5.74)$$

Unit: £m **Source:** ONS **Identifier:** ROAY

Comment: This is total FISIM-adjusted interest receipts of PNFCs. The forecast includes a FISIM-adjusted sterling interest income, using Bank Rate as a FISIM reference rate (the pure cost of funds) and the previous period's stock of sterling deposits (M4IC); adjusted interest income on foreign currency deposits, using an international short-term average rate (ROSHT); and adjusted-interest received from bond holdings, using the short money market rate (RS).

Total interest payments of PNFCs, excluding FISIM adjustment (DIPICx)

Model equation: Technical relationship (identity)

$$DIPICx = DIPIC + DIPICf \quad (5.75)$$

Unit: £m **Source:** ONS **Identifier:** I6PK

Comment: The sum of FISIM-adjusted interest paid (DIPIC) and the FISIM adjustment (DIPICf); effectively, the cash value of interest paid.

Total interest payments of PNFCs, FISIM component (DIPICf)

Model equation: Technical relationship

$$DIPICf = STLIC*(((1 + (RIC - R)/100) \hat{} 0.25) - 1) + FXLIC*(((1 + 2.9/100) \hat{} 0.25) - 1) \quad (5.76)$$

Unit: £m **Source:** ONS **Identifier:** IV86

Comment: The FISIM component of PNFC interest paid. In the forecast this is the sum of sterling interest, using the spread between Bank Rate (R) and the effective rate on bank lending to corporates (RIC) multiplied by the sterling share of PNFC loan liabilities (STLIC), and foreign currency interest, using a fixed spread on foreign currency loans (FXLIC).

Total interest payments of PNFCs, including FISIM adjustment (DIPIC)

Model equation: Technical relationship

$$\begin{aligned} DIPIC = {} & STLIC*(((1 + R/100)\hat{}0.25)-1) \\ & + FXLIC*(((1 + (ROSHT - 0.3)/100)\hat{}0.25) - 1) \\ & + BLIC*(((1 + (RL + 0.5)/100)\hat{}0.25) - 1) \end{aligned} \quad (5.77)$$

Unit: £m **Source:** ONS **Identifier:** ROCG

Comment: This is total FISIM-adjusted interest paid by PNFCs. The forecast uses Bank Rate as a FISIM reference rate (the pure cost of borrowing funds) for sterling loan liabilities (STLIC), a spread under ROSHT (a weighed average of short-term money market rates in major currencies) for foreign-currency liabilities and a spread over the long-term gilt rate (RL) for bond liabilities.

Withdrawals of income from quasi-corporations (WYQC)

Model equation: Technical relationship

$$ratio(WYQC) = ratio(FYCPR) \quad (5.78)$$

Unit: £m **Source:** ONS **Identifier:** NBOJ

Comment: Partnership income is a component of profits and of property income under ESA95. This grows in line with corporate profits (FYCPR) over the forecast period.

HH & NPISH dividend receipts (NDIVHH)

Model equation: Behavioural equation

$$\begin{aligned} NDIVHH = {} & \underset{(2.41)}{0.003} - \underset{(-1.85)}{0.00004}*ifle(200101)*(58-time(198701)) \\ & + \underset{(4.64)}{0.18}*(FYCPR+FISIM£)/EQLIC \\ & + \underset{(2.96)}{(1 - 0.74)}*NDIVHH(-1)/EQHH(-1) \\ & + \underset{(3.58)}{0.32}*NDIVHH(-3)/EQHH(-3) \\ & - \underset{(-3.46)}{0.13}*(FYCPR(-4)+FISIM£(-4))/EQLIC(-4))*EQHH \end{aligned} \quad (5.79)$$

Unit: £M **Source:** ONS **Identifier:** NRKU

Equation properties:

Estimation period: 1987Q1 to 2012Q4.

Adjusted R^2 = 0.44

Static long-run solution:

NDIVHH/EQHH= 0.10(FYCPR+FISIM£)/EQLIC*

Elasticity of NDIVHH/EQHH (average return on households' equity holdings) with respect to a 1% increase in:

	Q1	Q5	Q9	Long-run
Average UK corporate profit, per share outstanding (FYCPR+FISIM£)/EQLIC)	0.22%	0.17%	0.14%	0.10%

Comment: This model relates the quarterly rate of dividends earned on households' equity holdings (NDIVHH/EQHH) to UK-based corporates' earnings per share ((FYCPR+FISIM£)/EQLIC). Although this is not obviously a one-to-one relationship – UK households may hold non UK equities and UK corporates' current distributions may not directly correspond to current profits – there is a significant positive relationship, transmitted with some lags, and a long run response of 0.1.

Attributed property income of insurance policy holders (APIIH)

Model equation: Behavioural relationship

$$APIIH = PIHH(-1)*(0.8011*400*(APIIH(-1)/PIHH(-2)) \quad (5.80)$$
$$(16.66)$$
$$+ (1-0.8011)*RPIH + 0.011*ifle(199804) - 0.2863)/400$$
$$(16.66) \qquad (2.85) \qquad (-3.54)$$

Unit: £m **Source:** ONS **Identifier:** ROYP

where:

$$RPIH = 0.15*400*(DIPLDC + IILG + ILGUP)/(CGGILTS + MKTIG) \quad (5.81)$$
$$+ 0.12*(0.5 + 400*(DIPLDC + IILG + ILGUP)/$$
$$(CGGILTS + MKTIG)) + 0.19*ROLT$$

*+ 0.30*400*(NDIVHH/EQHH(-1))*
+ 0.18 400*(NDIVHH/EQHH(-1))*
*+ 0.04*RS + 0.02*ROSHT*

Equation properties:

Estimation period: 1987Q3 to 2012Q4.

Adjusted R^2 = 0.90

Static long-run solution:

APIIH/PIHH= RPIH

Elasticity of APIIH/PIIH(-1) with respect to a 1% increase in:

	Q1	Q5	Q9	Long-run
Average rate of return on insurance fund assets (RPIH)	0.36%	0.74%	0.89%	1%

Comment: This variable is forecast in two stages: first, by a forecast of insurance funds' assets' average rate of return; second, by an estimated relationship between RPIH and the average return on households' insurance reserves, APIIH/PIIH(-1) (PIIH is used as no distinct data for households' pension fund holdings is available).

The first stage uses weights based on the most recent year of data of insurance sector portfolio disposition (based on table E61 in the Economic Accounts). These are combined with rates of return by asset class – such as the rate of return on government debt ((DIPLDC+IILG+ILGUP)/(CGGILTS+MKTIG)) – to generate a single, weight average rate of return on insurance fund assets (RPIH).

The second stage uses a relationship between RPIH and APIIH/PIIH(-1), derived from a non-linear regression. The long-run elasticity constrained to 1 (so the coefficient on RPIH in equation 15.29b is equal to 1 – the coefficient on APIIH(-1)/PIIH(-2)) – so that the rate of return on household insurance fund assets is limited to the rate of return on the funds' underlying assets, in the long run.

Property income received by households (&NPISH) (PIRHH)

Model equation: Technical relationship (identity)

$$PIRHH = NDIVHH + APIIH + DIRHH + WYQC \quad (5.82)$$

Unit: £m **Source:** ONS **Identifier:** ROYL

Comment: The (small) residual on this equation is household receipts of rent on land and sub-soil assets.

Property income paid by households (&NPISH) (PIPHH)

Model equation: Technical relationship

$$PIPHH = DIPHH \quad (5.83)$$

Unit: £m **Source:** ONS **Identifier:** ROYT

Comment: The (small) residual between PIPHH and DIPHH (household debt interest payments) is household payments of rent on land and sub-soil assets. In the forecast, PIPHH is then constrained to equal DIPHH.

Employees' contributions to funded pension schemes (EECPP)

Model equation: Technical relationship

$$ratio(EECPP) = ratio(WFP) \quad (5.84)$$

Unit: £m **Source:** ONS **Identifier:** RNNN

Comment: Employees' contributions are forecast to grow in line with wages and salaries (WFP).

Employees' social contributions (EESC)

Model equation: Technical relationship (identity)

$$EESC = EESCLA + EENIC + EECPP + EESCCG \quad (5.85)$$

Unit: £m **Source:** ONS **Identifier:** RPHX+RPHY

Household disposable income (HHDI)

Model equation: Technical relationship (identity)

$$HHDI = MI + FYEMP - EMPSC - EESC - TYWHH + NMTRHH + SBHH + (PIRHH - PIPHH + FSMADJ) - HHSB + HHISC + (EECOMPC - EECOMPD) + OSHH \quad (5.86)$$

Unit: £m **Source:** ONS **Identifier:** RPHQ

Comment: Household Disposable Income (HHDI) in current prices is the sum of the components of gross income, net of taxes and social contributions.

Real household disposable income (RHHDI)

Model equation: Technical relationship (identity)

$$RHHDI = 100*HHDI/PCE \quad (5.87)$$

Unit: £m **Source:** ONS **Identifier:** NRJR

Comment: Real household disposable income is nominal disposable income (HHDI) deflated by the consumer expenditure deflator (PCE).

Employees' contributions to funded pension schemes (EMPCPP)

Model equation: Technical relationship

$$ratio(EMPCPP) = ratio(WFP) \quad (5.88)$$

Unit: £m **Source:** ONS **Identifier:** RNNG

Adjustment for change in net equity of HH pension funds (NEAHH)

Model equation: Technical relationship (identity)

$$NEAHH = EMPCPP + EECPP - OSB \quad (5.89)$$

Unit: £m **Source:** ONS **Identifier:** RPQJ

Comment: This represents contributions to, less payments from pension funds, and is included in gross savings (SVHH) and the saving ratio (SY).

Household (and NPISH) gross saving (SVHH)

Model equation: Technical relationship (identity)

$$SVHH = HHDI + NEAHH - C£ \quad (5.90)$$

Unit: £m **Source:** ONS **Identifier:** RPQL

Comment: Household saving includes an adjustment for net equity in pension funds (NEAHH). This reflects the fact that the reserves of pension funds are treated as being owned by the household sector and that contributions to and pensions received from private funded schemes are treated as transfers in the secondary distribution of income account.

Households' saving ratio (SY)

Model equation: Technical relationship (identity)

$$SY = 100*(SVHH/(NEAHH+HHDI)) \quad (5.91)$$

Unit: £m **Source:** ONS **Identifier:** NRJS

Comment: This is – by definition – the ratio of gross savings (SVHH) to adjusted household disposable income (including an adjustment for net contributions to private sector pension funds, NEAHH).

Net capital transfers of households (and NPISH) (KGHH)

Model equation: Technical relationship

$$KGHH = - INHT + MIKTFA - MIKTA + 0.95*KLA + 0.55*KCGPSO + 0.4*EUKT \quad (5.92)$$

Unit: £m **Source:** ONS **Identifier:** RPVO+RPVP-RPVS-RPVT

Comment: This is a partial identity, including transfers directly to the household sector (such as net migrants' transfers, MIKTFA-MIKTA) and a share of UK-wide transfers, such as KLA and KCGPSO (capital transfers from local and central government).

Net lending (from capital account): households (seasonally-adjusted) (NAFHH)

Model equation: Technical relationship (identity)

$$NAFHH = SVHH + KGHH - DINVHH - VALHH - NPAHH - IHH£ \quad (5.93)$$

Unit: £m ***Source:*** ONS ***Identifier:*** RPZT

Comment: The identity for households' net lending (or 'financial surplus') is the balancing item in the household sector capital account. This represents the flow of unspent, uninvested resources that are available to make net acquisitions of financial assets in excess of net acquisition of liabilities.

Net lending (from capital account): private corporations (seasonally-adjusted) (NAFCO)

Model equation: Technical relationship (identity)

$$NAFCO = -NAFHH + CB + EUKT + (MIKTFA - MIKTA) - CGKTA - OPSKTA + NPAA + SDE£ - SDI + PSNBCY \quad (5.94)$$

Unit: £m ***Source:*** ONS ***Identifier:*** RPYN+RQBV

Comment: Companies' net acquisition of financial assets (i.e. financial surplus or deficit) is obtained as a residual, given non-corporate net acquisitions.

Net lending (from capital account): financial corporations (seasonally-adjusted) (NAFFC)

Model equation: Technical relationship

$$NAFFC = FISIM£ - NEAHH - BLEVY - 2640 \quad (5.95)$$

Unit: £m ***Source:*** ONS ***Identifier:*** RPYN

Comment: Financial companies' (FINCOs) net acquisition of financial assets – i.e. financial surplus or deficit – is imposed and determines the PNFC net acquisition of financial assets (NAFIC) by residual.

Net lending (from capital account): private non-financial corporations (seasonally-adjusted) (NAFIC)

Model equation: Technical relationship (identity)

$$NAFIC = NAFCO - NAFFC \quad (5.96)$$

Unit: £m ***Source:*** ONS ***Identifier:*** RQBV

Comment: PNFC net acquisition of financial assets (NAFIC) is a residual of other corporates' acquisitions (NAFCO, NAFFC).

Private corporate (financial and non-financial) gross saving (SAVCO)

Model equation: Technical relationship (identity)

$$\begin{aligned} SAVCO = \; & NAFCO + KGHH - DINVHH + DINV£ - DINVCG \\ & + VAL£ - VALHH - NPAHH + IF£ - IHH£ - NPACG \\ & - CGI£ - KLA - KCGPSO - LAI£ - NPALA + INHT \\ & + KGLA - EUKT - MIKTFA + MIKTA + CGKTA \\ & + OPSKTA - NPAA - IPC£ - IBPC \end{aligned} \quad (5.97)$$

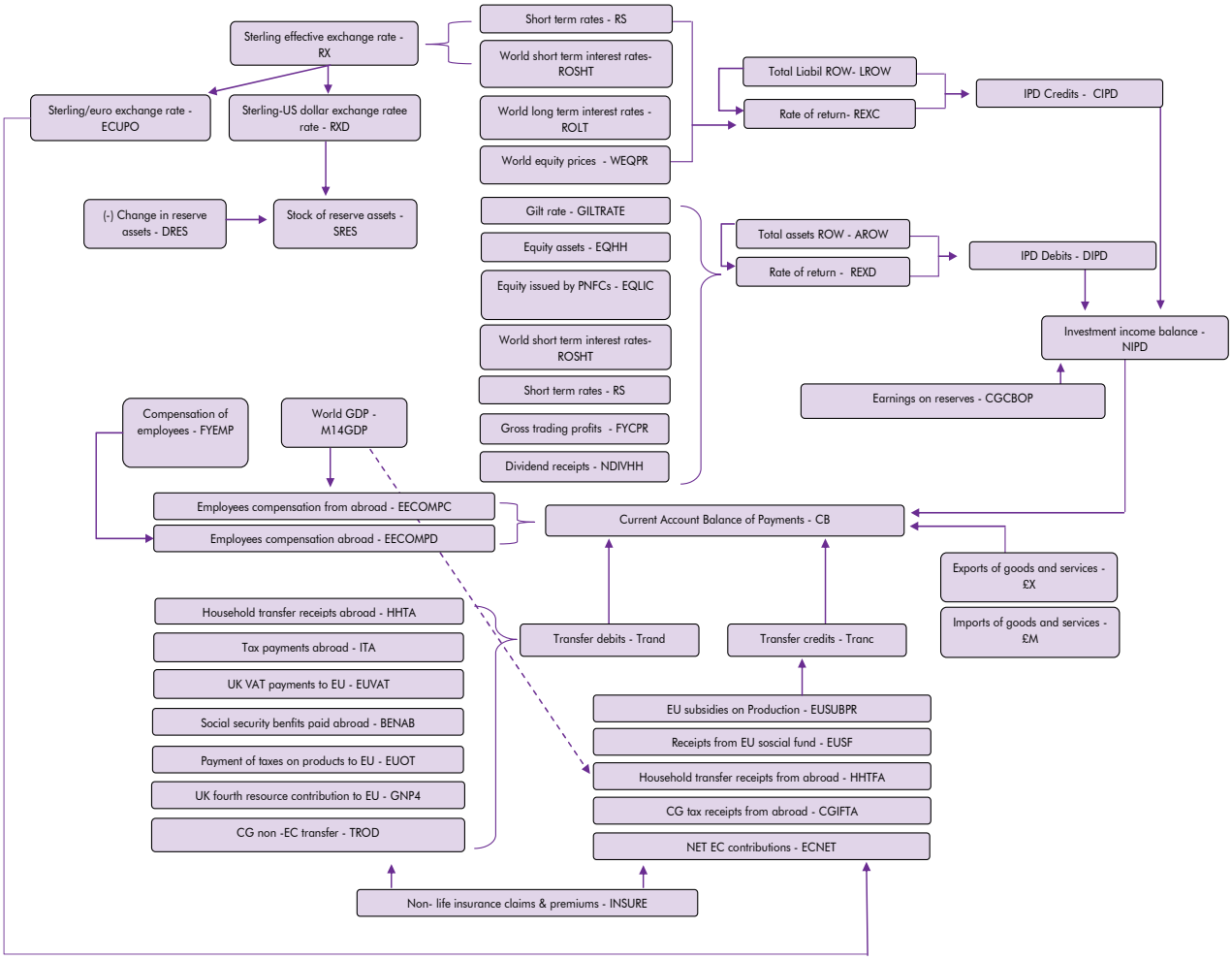
Unit: £m ***Source:*** ONS ***Identifier:*** RPKZ+RPPS

Comment: Company sector savings are obtained as a residual, given the savings of other sectors.

Balance of payments

This group contains the model's system of exchange rate equations, investment income flows, international transfer payments and balance of payments identities.

Figure 5.5: Balance of Payments



Exchange rate equations

ERI-weighted 3 month interest rate (ROSHT)

Model equation: Imposed variable

$$ROSHT = ROSHT(-1) \qquad (5.98)$$

Unit: Per cent **Source:** OECD **Identifier:** -

Comment: ERI-weighted 3 month interest rate: Euro+ USD+Japanese Yen+Canadian Dollar. ERI weights (available on the BoE website) are used so that the interest rate is the appropriate one to enter into a UIP condition. In the OBR forecast, forward curves for the interest rate of each currency are used to produce an exogenous forecast for ROSHT.

Sterling effective exchange rate (RX)

Model equation: Technical relationship

$$log(RX) = log(RX(-1)) + log((1 + ROSHT(-1)/400)/(1 + RSM(-1)/400)) \qquad (5.99)$$

Unit: Index **Source:** ONS **Identifier:** BK67

Comment: The exchange rate equation is based on an uncovered interest parity condition (UIP). The equation is 'backwards-looking', in that it defines the current exchange rate in terms of the past exchange rate and interest rate differentials. This produces an exchange rate forecast that is consistent with a given path of domestic and foreign interest rates together with a zero-arbitrage assumption.

Sterling – dollar cross rate (RXD)

Model equation: Technical relationship

$$RXD = RXD(-1)*ratio(RX) \qquad (5.100)$$

Unit: Rate **Source:** ONS **Identifier:** AUSS

Comment: As the model does not separately identify interest rates for different currencies in the ERI basket, the bilateral US Dollar – Sterling exchange rate is assumed to be proportional to the ERI.

Sterling – Euro exchange rate (ECUPO)

Model equation: Technical relationship

$$ECUPO = ECUPO(-1)*ratio(RX) \quad (5.101)$$

Unit: Rate **Source:** ONS **Identifier:** THAP

Comment: As the model does not separately identify interest rates for different currencies in the ERI basket, the bilateral Euro – Sterling exchange rate is assumed to be proportional to the ERI.

Various variables

GDP-weighted long-term interest rate(ROLT)

Model equation: Imposed variable

$$ROLT = ROLT(-1) \quad (5.102)$$

Unit: Per cent **Source:** OECD **Identifier:** -

Comment: GDP-weighted 10 year interest rate. EU+US+Japan+Canada. ERI weights (available on the BoE website) are used consistent with ROSHT. In the OBR forecast, forward curves for the interest rate of each currency are used to produce a forecast for ROLT.

World equity prices (WEQPR)

Model equation: Imposed variable

$$WEQPR = WEQPR(-1) \quad (5.103)$$

Unit: Index **Source:** OECD **Identifier:** -

Comment: GDP-weighted, includes G6 countries and Spain.

Changes to foreign currency reserves (DRES)

Model equation: Imposed variable

$$diff(DRES) = 0 \quad (5.104)$$

Unit: £m **Source:** ONS **Identifier:** AIPA(LTCV)

Comment: Drawings on or additions to official foreign currency reserves (including official borrowing). Accounting convention: positive DRES indicates a flow out of reserves.

Stock of total official reserves (SRES)

Model equation: Technical relationship

$$SRES = - DRES + (1 + 0.27*(RXD(-1)/RXD - 1) + 0.25*(RX(-1)/RX - 1))*SRES(-1) \quad (5.105)$$

Unit: £m **Source:** ONS **Identifier:** LTEB

Investment Income Balance

Overall rate of return on assets (REXC)

Model equation: Technical relationship

$$\begin{aligned} REXC = {} & (DLROW(-1)/LROW(-1))*(2.47 + 0.019*100*(log(WEQPR) \\ & - log(WEQPR(-4)) + ADJDRL) \\ & + (EQLROW(-1)/LROW(-1))* (0.378+0.004*T + ADJREQL) \\ & + (BLROW(-1)/LROW(-1))*(ROLT/4-0.17 + ADJRBL) \\ & + (OTLROW(-1)/LROW(-1))*((1-0.88)*ROSHT/4 \\ & + 0.88*RS/4 - 0.05 + ADJROL) \end{aligned} \quad (5.106)$$

Unit: - **Source:** OBR **Identifier:** N/A

Comment: The equations for the rates of return on each asset are weighted by portfolio shares to give an overall predicted rate of return.

Investment Income Credits (CIPD)

Model equation: Technical relationship

$$CIPD = 0.717*CIPD(-1)/LROW(-2) + (1 - 0.717) *REXC/100)*LROW(-1) \quad (5.107)$$

Unit: £m **Source:** ONS **Identifier:** HBOK-HHCC

Comment: Balance of Payments investment income credits (CIPD) are specified as an autoregressive process, with the coefficients estimated on the data subject to the constraint that a change in REXC eventually feeds through fully into the actual rate of return. Around ¾ of a change feeds through within one year.

Overall rate of return on assets (REXD)

Model equation: Technical relationship

$$REXD = (DAROW(-1)/(AROW(-1))*(-2.67 + 0.28*100*FYCPR/GDPM£ + 0.01*100*d4log(EQPR)) + ADJDRA) + (EQAROW(-1)/AROW(-1))*(0.716 - 0.009*T + 0.62*100*NDIVHH/EQHH) + ADJREQA) + (BAROW(-1)/AROW(-1))*(RLM/4 - 0.19 + ADJRBA) + (OTAROW(-1)/AROW(-1))*(0.15*RS/4 + (1 -0.15)*ROSHT/4 + 0.04 + ADJROA) \quad (5.108)$$

Unit: - **Source:** OBR **Identifier:** N/A

Comment: This is modelled in the same way as the overall rate of return on assets.

Investment Income Debits (DIPD)

Model equation: Technical relationship

$$DIPD = 0.63*DIPD(-1)/AROW(-2) + (1 - 0.63)*REXD/100)*AROW(-1) \quad (5.109)$$

Unit: £m **Source:** ONS **Identifier:** HBOL

Comment: Balance of Payments investment income debits (DIPD) are specified as an autoregressive process, with the coefficients estimated on the data subject to the constraint that a change in REXD eventually feeds through fully into the actual rate of return. Around 85 per cent of a change feeds through within one year.

CG earnings on reserve (CGCBOP)

Model equation: Technical relationship

$$diff(CGCBOP) = diff(CGC) \quad (5.110)$$

Unit: £m **Source:** ONS **Identifier:** HHCC

Comment: CG earnings on reserves: scoring in Balance of Payments.

Net UK Investment income (NIPD)

Model equation: Technical relationship (identity)

$$NIPD = CIPD - DIPD + CGCBOP \quad (5.111)$$

Unit: £m **Source:** ONS **Identifier:** HBOM

Overseas transfers

Employees compensation due abroad (EECOMPD)

Model equation: Technical relationship

$$ratio(EECOMPD) = ratio(FYEMP) \quad (5.112)$$

Unit: £m **Source:** ONS **Identifier:** IJAI

Employees compensation from abroad (EECOMPC)

Model equation: Technical relationship

$$ratio(EECOMPC) = ratio(MAJGP) \quad (5.113)$$

Unit: £m **Source:** ONS **Identifier:** IJAH

EU subsidies on products (EUSUBP)

Model equation: Technical relationship

$$EUSUBP = 0 \quad (5.114)$$

Unit: £m **Source:** ONS **Identifier:** FKNG

Comment: This consists of total agricultural subsidies less subsidies on agricultural production i.e. set-aside and credits from the European Coal and Steel Community (now largely zero), and a longer run of data can be found using the identifiers ZXIA-ZJZD+FHHS.

EU subsidies on production (EUSUBPR)

Model equation: Technical relationship

$$EUSUBPR = EUSUBPR(-1)*ECUPO(-1)/ECUPO \quad (5.115)$$

Unit: £m **Source:** ONS **Identifier:** FHLK

Comment: A longer run of data is available using the identifier ZJZD - see comment for EUSUBP. EUSF is assumed to remain fixed in Euro terms, hence revaluation from the bilateral exchange rate.

Receipts from EU Social Fund (EUSF)

Model equation: Technical relationship

$$EUSF = EUSF(-1)*ECUPO(-1)/ECUPO \quad (5.116)$$

Unit: £m **Source:** ONS **Identifier:** H5U3

Net EC contributions (ECNET)

Model equation: Technical relationship

$$ECNET = (1 - 0.5*(ECUPO(-1)/ECUPO - 1))*ECNET(-1) \quad (5.117)$$

Unit: £m **Source:** ONS **Identifier:** -FKLL-FKIJ

UK fourth resource contribution to EU (GNP4)

Model equation: Technical relationship

$$GNP4 = 0.01*((GDPM£ + NIPD + EECOMPC - EECOMPD)/ECUPO(-4)) \quad (5.118)$$

Unit: £m **Source:** ONS **Identifier:** HCSO+HCSM

UK VAT payments to the EU (EUVAT)

Model equation: Technical relationship

$$EUVAT = 0.03*VREC/(0.83*ECUPO(-4)) \quad (5.119)$$

Unit: £m **Source:** ONS **Identifier:** HCML+FSVL

Payments of taxes on product to EU (EUOT)

Model equation: Technical relationship

$$ratio(EUOT) = ratio(GDPM£) \quad (5.120)$$

Unit: £m **Source:** ONS **Identifier:** FJWE+FJWG

Social security benefits paid abroad (BENAB)

Model equation: Technical relationship

$$BENAB = 0.01*CGSB \quad (5.121)$$

Unit: £m **Source:** ONS **Identifier:** FLUK

CG Non-EC transfer debits (TROD)

Model equation: Imposed variable

$$TROD = TROD(-1) \quad (5.122)$$

Unit: £m **Source:** ONS **Identifier:** FJUO-FJCK-HCSO-HCSM

CG tax receipts from abroad (CGITFA)

Model equation: Technical relationship

$$CGITFA = ITA \quad (5.123)$$

Unit: £m **Source:** ONS **Identifier:** CGDN

Tax payments abroad (ITA)

Model equation: Technical relationship

$$ITA = 0.001*WFP + 0*CIPD \quad (5.124)$$

Unit: £m **Source:** ONS **Identifier:** FLVE

Household transfer receipts from abroad (HHTFA)

Model equation: Technical relationship

$$log(HHTFA) = log(HHTFA(-1)*MAJGDP/MAJGDP(-1)) \quad (5.125)$$

Unit: £m **Source:** ONS **Identifier:** CGDO-FKNN-FLYE

Household transfer payments to abroad (HHTA)

Model equation: Technical relationship

$$ratio(HHTA) = ratio(WFP) \quad (5.126)$$

Unit: £m **Source:** ONS **Identifier:** CGDS-FLVY-FHLS-FLVE

Comment: This is largely remittances. Since an identifier for seasonally adjusted data is not available, a seasonally adjusted series is obtained by residual.

Non-life insurance claims and premiums (INSURE)

Model equation: Imposed variable

$$INSURE = INSURE(-1) \quad (5.127)$$

Unit: £m **Source:** ONS **Identifier:** FKNN+FLVY

Transfer credits (TRANC)

Model equation: Technical relationship (identity)

$$TRANC = EUSUBP + HHTFA + EUSF + CGITFA + EUSUBPR - ECNET + INSURE \quad (5.128)$$

Unit: £m **Source:** ONS **Identifier:** IKBN

Transfer debits (TRAND)

Model equation: Technical relationship (identity)

$$TRAND = TROD + EUVAT + EUOT + HHTA + GNP4 + BENAB + ITA + INSURE \quad (5.129)$$

Unit: £m **Source:** ONS **Identifier:** IKBO

Transfer balance (TRANB)

Model equation: Technical relationship (identity)

$$TRANB = TRANC - TRAND \quad (5.130)$$

Unit: £m **Source:** ONS **Identifier:** IKBP

Comment: The transfer variables are included primarily as a check on the data.

Capital transfers

Central Government capital transfers abroad (CGKTA)

Model equation: Technical relationship

$$CGKTA = 0.042*KCGPSO \quad (5.131)$$

Unit: £m **Source:** ONS **Identifier:** FLWB

Capital transfer payments from EU (EUKT)

Model equation: Imposed variable

$$EUKT = EUKT(-1) \quad (5.132)$$

Unit: £m **Source:** ONS **Identifier:** GTTY

Migrants capital transfer from abroad (MIKTFA)

Model equation: Imposed variable

$$log(MIKTFA) = log(MIKTFA(-1)) \quad (5.133)$$

Unit: £m **Source:** ONS **Identifier:** FHJC

Migrants capital transfer to abroad (MIKTA)

Model equation: Imposed variable

$$log(MIKTA) = log(MIKTA(-1)) \quad (5.134)$$

Unit: £m **Source:** ONS **Identifier:** FLWJ

Other private sector capital transfers abroad (OPSKTA)

Model equation: Imposed variable

$$OPSKTA = OPSKTA(-1) \quad (5.135)$$

Unit: £m **Source:** ONS **Identifier:** FLWI-FLWJ

Net acquisition of non-produced non-financial assets (NPAA)

Model equation: Imposed variable

$$NPAA = NPAA(-1) \quad (5.136)$$

Unit: £m **Source:** ONS **Identifier:** FHJL-FLWT

Current balance

Balance of trade in goods and services (TB)

Model equation: Technical relationship (identity)

$$TB = X£ - M£ \quad (5.137)$$

Unit: £m, CVM **Source:** ONS **Identifier:** IKBJ

Current account Balance of Payments (CB)

Model equation: Technical relationship (identity)

$$CB = TB + (EECOMPC - EECOMPD) + NIPD + TRANDC - TRAND \quad (5.138)$$

Unit: £m **Source:** ONS **Identifier:** HBOP

Current account Balance of Payments, per cent of GDP (CB%)

Model equation: Technical relationship (identity)

$$CB\% = (CB/GDPM£)*100 \quad (5.139)$$

Unit: Per cent **Source:** ONS **Identifier:** AA6H

Net lending by Rest of the World (SA from capital a/c) (NAFROW)

Model equation: Technical relationship (identity)

$$NAFROW = -(CB + (EUKT + MIKTFA) - (CGKTA + MIKTA + OPSKTA) + NPAA) \quad (5.140)$$

Unit: £m **Source:** ONS **Identifier:** RQCH

Comment: This is equal to current account plus capital account in balance of payments terms. With the removal of seasonal factors and the addition of the statistical discrepancy it is equal in magnitude – and opposite in sign – to the balance of the financial account.

6 Public sector

Receipts

This group covers all taxes, National Insurance contributions and other receipts. The group now contains only technical relationships and 'imposed' variables, where the forecast for a variable is imposed upon the macroeconomic model having been estimated using other models. Such variables are 'endogenous' in the sense that they determined by other variables – such as wages, profits and consumer spending – but they are estimated using the models for individual taxes run for the OBR by HM Revenue & Customs. Further details of how the forecast is produced are set out in OBR, 2011, *Forecasting the public finances*.

Previously the group contained behavioural equations for the main tax receipts, although these were not used to produce the receipts forecast. Please see the 2008 version of the Macroeconomic model documentation for information about these behavioural equations. As the macroeconomic model is not used to produce the receipts forecast the behavioural equations within the group became significantly out of date following changes to the tax system over a number of years. We have therefore removed the behavioural equations for this publication but details about the equations are available in previous versions of the model documentation.

Although the behavioural equations have now been removed, the macroeconomic model still needs a receipts group as the variables within the group feed into other parts of the model. For example, elements within the group feed into household disposable income and the basic price adjustment.

Direct taxes

Basic rate of income tax (TPBRZ)

Model equation: Imposed variable

$$TPBRZ = TPBRZ(-1) \quad (6.1)$$

Unit: Rate **Source:** HMRC **Identifier:** N/A

Taxes on income from employment (TYEM)

Model equation: Imposed variable

$$TYEM = TYEM(-1) \quad (6.2)$$

Unit: £m **Source:** ONS **Identifier:** DBBO

Income tax accruals adjustment (INCTAC)

Model equation: Imposed variable

$$INCTAC = INCTAC(-1) \quad (6.3)$$

Unit: £m **Source:** ONS **Identifier:** CYNX+RUTC+DKHE+DBKE+KIY5

Company IT withheld accruals adjustment (FCACA)

Model equation: Imposed variable

$$FCACA = FCACA(-1) \quad (6.4)$$

Unit: £m **Source:** ONS **Identifier:** DKHH + ZYBE

Taxes on self-employment incomes (TSEOP)

Model equation: Imposed variable

$$TSEOP = TSEOP(-1) \quad (6.5)$$

Unit: £m **Source:** ONS **Identifier:** ZAFG

Employees' and self employed payments of NICs (EENIC)

Model equation: Imposed variable

$$EENIC = EENIC(-1) \quad (6.6)$$

Unit: £m **Source:** ONS **Identifier:** AIIH-CEAN

Employers' payments of NICs (EMPNIC)

Model equation: Imposed variable

$$EMPNIC = EMPNIC(-1) \quad (6.7)$$

Unit: £m **Source:** ONS **Identifier:** CEAN

National insurance accruals adjustment (NICAC)

Model equation: Imposed variable

$$NICAC = NICAC(-1) \quad (6.8)$$

Unit: £m **Source:** ONS **Identifier:** AIIH-ABLP

Inheritance tax (INHT)

Model equation: Imposed variable

$$INHT = INHT(-1) \tag{6.9}$$

Unit: £m ***Source:*** ONS ***Identifier:*** ACCH+LSON

Capital gains tax (CGT)

Model equation: Imposed variable

$$CGT = CGT(-1) \tag{6.10}$$

Unit: £m ***Source:*** ONS ***Identifier:*** QYJX

Swiss capital tax (SWISSCAP)

Model equation: Imposed variable

$$SWISSCAP = SWISSCAP(-1) \tag{6.11}$$

Unit: £m ***Source:*** ONS ***Identifier:*** KW69

Petroleum revenue tax (PRT)

Model equation: Imposed variable

$$PRT = PRT(-1) \tag{6.12}$$

Unit: £m ***Source:*** ONS ***Identifier:*** ACCJ

North Sea corporation tax payments (NSCTP)

Model equation: Imposed variable

$$NSCTP = NSCTP(-1) \quad (6.13)$$

Unit: £m **Source:** ONS **Identifier:** DBJY

Corporation tax rate (TCPRO)

Model equation: Imposed variable

$$TCPRO = TCPRO(-1) \quad (6.14)$$

Unit: Rate **Source:** HMRC **Identifier:** N/A

Onshore corporation tax (NNSCTP)

Model equation: Imposed variable

$$NNSCTP = NNSCTP(-1) \quad (6.15)$$

Unit: £m **Source:** ONS **Identifier:** ACCD+JPPT-MDXH-DBJY

Corporation tax (gross of tax credits) (CT)

Model equation: Technical relationship (identity)

$$CT = NSCTP + NNSCTP \quad (6.16)$$

Unit: £m **Source:** ONS **Identifier:** ACCD-MDXH+JPPT

Other company taxes on investment (TCINV)

Model equation: Imposed variable

$$TCINV = TCINV(-1) \quad (6.17)$$

Unit: £m **Source:** ONS **Identifier:** GRXE

Tax on Local Authority Equal Pay Settlements (LAEPS)

Model equation: Imposed variable

$$LAEPS = LAEPS(-1) \quad (6.18)$$

Unit: £m **Source:** ONS **Identifier:** C625

Public corporations onshore corporation tax payments (TYPCO)

Model equation: Imposed variable

$$TYPCO = TYPCO(-1) \quad (6.19)$$

Unit: £m **Source:** ONS **Identifier:** FCCS+JW27

Income tax gross of tax credits (INCTAXG)

Model equation: Technical relationship (identity)

$$INCTAXG = TYEM + TSEOP + TCINV - INCTAC + CTC - NPISHTC \quad (6.20)$$

Unit: £m **Source:** ONS **Identifier:** LIPG

Bank payroll tax (BANKROLL)

Model equation: Imposed variable

$$BANKROLL = BANKROLL(-1) \quad (6.21)$$

Unit: £m **Source:** ONS **Identifier:** JT2Q

Bank levy (BLEVY)

Model equation: Imposed variable

$$BLEVY = BLEVY(-1) \quad (6.22)$$

Unit: £m **Source:** ONS **Identifier:** KIH3

Betting tax scored as taxes on income and wealth (BETPRF)

Model equation: Imposed variable

$$BETPRF = BETPRF(-1) \quad (6.23)$$

Unit: £m **Source:** ONS **Identifier:** MIYF

Betting levies scored as taxes on income and wealth (BETLEVY)

Model equation: Imposed variable

$$BETLEVY = BETLEVY(-1) \quad (6.24)$$

Unit: £m **Source:** ONS **Identifier:** DW9E

OFGEM renewable energy tax (OFGEM)

Model equation: Imposed variable

$$OFGEM = OFGEM(-1) \quad (6.25)$$

Unit: £m *Source:* ONS *Identifier:* EO2E

MIRAS, LAPRAS and PMI scored as receipts (MILAPM)

Model equation: Imposed variable

$$MILAPM = MILAPM(-1) \quad (6.26)$$

Unit: £m *Source:* ONS *Identifier:* GCJG

Indirect taxes

Stamp duty receipts (TSD)

Model equation: Imposed variable

$$TSD = TSD(-1) \quad (6.27)$$

Unit: £m *Source:* ONS *Identifier:* ACCI

Higher rate of VAT (TVAT)

Model equation: Imposed variable

$$TVAT = TVAT(-1) \quad (6.28)$$

Unit: Rate *Source:* HMRC *Identifier:* N/A

Net VAT receipts (VREC)

Model equation: Imposed variable

$$VREC = VREC(-1) \quad (6.29)$$

Unit: £m **Source:** ONS **Identifier:** EYOO

Hydrocarbon oils duty receipts (TXFUEL)

Model equation: Imposed variable

$$TXFUEL = TXFUEL(-1) \quad (6.30)$$

Unit: £m **Source:** ONS **Identifier:** ACDD

Tobacco duty (TXTOB)

Model equation: Imposed variable

$$TXTOB = TXTOB(-1) \quad (6.31)$$

Unit: £m **Source:** ONS **Identifier:** ACDE

Alcohol duties: beers, wines & spirits (TXALC)

Model equation: Imposed variable

$$TXALC = TXALC(-1) \quad (6.32)$$

Unit: £m **Source:** ONS **Identifier:** ACDF+ACDG+ACDH+ACDI

Climate change levy (CCL)

Model equation: Imposed variable

$$CCL = CCL(-1) \quad (6.33)$$

Unit: £m ***Source:*** ONS ***Identifier:*** LSNS

Aggregates Levy (AL)

Model equation: Imposed variable

$$AL = AL(-1) \quad (6.34)$$

Unit: £m ***Source:*** ONS ***Identifier:*** MDUP

Misc C&E taxes (TXCUS)

Model equation: Imposed variable

$$TXCUS = TXCUS(-1) \quad (6.35)$$

Unit: £m ***Source:*** ONS ***Identifier:*** ACDJ+ACDP+ACDO+DOLC

Customs and Excise taxes (CETAX)

Model equation: Technical relationship (identity)

$$CETAX = VREC + TXFUEL + TXTOB + TXALC + EUOT + CCL + AL + TXCUS \quad (6.36)$$

Unit: £m ***Source:*** ONS ***Identifier:*** ACAC

HMRC indirect taxes accruals adjustments (EXDUTAC)

Model equation: Technical relationship (identity)

$$EXDUTAC = EXDUTAC(-1) \quad (6.37)$$

Unit: £m ***Source:*** ONS ***Identifier:*** RUSD

Rail Franchise Payments (RFP)

Model equation: Imposed variable

$$RFP = RFP(-1) \quad (6.38)$$

Unit: £m ***Source:*** ONS ***Identifier:*** LITT

Miscellaneous taxes on products (TXMIS)

Model equation: Imposed variable

$$TXMIS = TXMIS(-1) \quad (6.39)$$

Unit: £m ***Source:*** ONS ***Identifier:*** LIYH

Renewable Obligation Certificates, tax on products (ROCS)

Model equation: Imposed variable

$$ROCS = ROCS(-1) \quad (6.40)$$

Unit: £m ***Source:*** ONS ***Identifier:*** EP89

Vehicle Excise Duty (VED)

Model equation: Technical relationship (identity)

$$VED = VEDHH + VEDCO \quad (6.41)$$

Unit: £m **Source:** ONS **Identifier:** GTAX

VED paid by other sectors; production tax (VEDCO)

Model equation: Imposed variable

$$VEDCO = VEDCO(-1) \quad (6.42)$$

Unit: £m **Source:** ONS **Identifier:** GTAX-CDDZ

VED paid by HH; current taxes (VEDHH)

Model equation: Imposed variable

$$VEDHH = VEDHH(-1) \quad (6.43)$$

Unit: £m **Source:** ONS **Identifier:** CDDZ

BBC licence fees (BBC)

Model equation: Imposed variable

$$BBC = BBC(-1) \quad (6.44)$$

Unit: £m **Source:** ONS **Identifier:** DH7A

Passport fees (PASSPORT)

Model equation: Imposed variable

$$PASSPORT = PASSPORT(-1) \quad (6.45)$$

Unit: £m ***Source:*** ONS ***Identifier:*** E8A6

Other household taxes (OHT)

Model equation: Imposed variable

$$OHT = OHT(-1) \quad (6.46)$$

Unit: £m ***Source:*** ONS ***Identifier:*** NSFA+ CQTC+NRQB+IY9O

Other current taxes: received by Central Government (OCT)

Model equation: Technical relationship (identity)

$$OCT = VEDHH + BBC + PASSPORT + OHT \quad (6.47)$$

Unit: £m ***Source:*** ONS ***Identifier:*** NMCV-CQOQ

EU Emission Trading Scheme receipts (EUETS)

Model equation: Imposed variable

$$EUETS = EUETS(-1) \quad (6.48)$$

Unit: £m ***Source:*** ONS ***Identifier:*** M98G

Other taxes on production (OPT)

Model equation: Imposed variable

$$OPT = OPT(-1) \tag{6.49}$$

Unit: £m **Source:** ONS **Identifier:** NZFS+NZFV+LITR+NSEZ+CUDB+LITK+DFT5

Local Authority receipts of production taxes (LAPT)

Model equation: Imposed variable

$$LAPT = LAPT(-1) \tag{6.50}$$

Unit: £m **Source:** ONS **Identifier:** NMYH

Community infrastructure levy (CIL)

Model equation: Imposed variable

$$CIL = CIL(-1) \tag{6.51}$$

Unit: £m **Source:** OBR **Identifier:** N/A

Receipts from carbon reduction commitment, feed-in tariffs and Warm Homes Discount (ENVLEVY)

Model equation: Imposed variable

$$ENVLEVY = ENVLEVY(-1) \tag{6.52}$$

Unit: £m **Source:** ONS **Identifier:** L8UA

VAT refunds to LAs (LAVAT)

Model equation: Imposed variable

$$LAVAT = LAVAT(-1) \quad (6.53)$$

Unit: £m **Source:** ONS **Identifier:** CUCZ

VAT refunds, except to LAs (XLAVAT)

Model equation: Imposed variable

$$XLAVAT = XLAVAT(-1) \quad (6.54)$$

Unit: £m **Source:** ONS **Identifier:** CUNW

Non-tax receipts

CG interest receipts: earnings on reserves (CGC)

Model equation: Technical relationship

$$CGC = ((1+(ROSHT - 0.3)/100)\ \hat{}\ 0.25 - 1)* SRES(-1) + 118 \quad (6.55)$$

Unit: £m **Source:** ONS **Identifier:** D69U

CG interest and dividends from Private Sector and RoW (CGNDIV)

Model equation: Technical relationship (identity)

$$CGNDIV = CGNDIV(-1) \quad (6.56)$$

Unit: £m **Source:** ONS **Identifier:** GVHE

LA interest and dividends from Private Sector and RoW (LANDIV)

Model equation: Technical relationship (identity)

$$LANDIV = LANDIV(-1) \quad (6.57)$$

Unit: £m **Source:** ONS **Identifier:** GVHF

PC interest and dividends from Private Sector and RoW (PCNDIV)

Model equation: Imposed variable

$$PCNDIV = PCNDIV(-1) \quad (6.58)$$

Unit: £m **Source:** ONS **Identifier:** GVHG-JW29

Public Sector interest and dividend receipts (PSINTR)

Model equation: Technical relationship (identity)

$$PSINTR = CGNDIV + LANDIV + PCNDIV \quad (6.59)$$

Unit: £m **Source:** ONS **Identifier:** JW2L + JW2M

Household transfer to CG (HHTCG)

Model equation: Imposed variable

$$HHTCG = HHTCG(-1) \quad (6.60)$$

Unit: £m **Source:** ONS **Identifier:** NMEZ

CG rent receipts (RNCG)

Model equation: Imposed variable

$$RNCG = RNCG(-1) \quad (6.61)$$

Unit: £m **Source:** ONS **Identifier:** NMCK

CG rent and other current transfers (CGRENT)

Model equation: Technical relationship (identity)

$$CGRENT = RNCG + HHTCG \quad (6.62)$$

Unit: £m **Source:** ONS **Identifier:** ANBU

LA rent and other current transfers (LARENT)

Model equation: Imposed variable

$$LARENT = LARENT(-1) \quad (6.63)$$

Unit: £m **Source:** ONS **Identifier:** ANBX

PC rent and other current transfers (PCRENT)

Model equation: Imposed variable

$$PCRENT = PCRENT(-1) \quad (6.64)$$

Unit: £m **Source:** ONS **Identifier:** ANCW

Council tax accruals (CC)

Model equation: Imposed variable

$$CC = CC(-1) \quad (6.65)$$

Unit: £m **Source:** ONS **Identifier:** NMIS

National non-domestic rates accrued receipts (NNDRA)

Model equation: Imposed variable

$$NNDRA = NNDRA(-1) \quad (6.66)$$

Unit: £m **Source:** ONS **Identifier:** CUKY

MIRAS, LAPRAS and PMI scored as expenditure (MILAPME)

Model equation: Imposed variable

$$MILAPME = MILAPME(-1) \quad (6.67)$$

Unit: £m **Source:** ONS **Identifier:** DCHG+DCHF+GCJJ

VTR and other reliefs scored as expenditure (VTRCS)

Model equation: Imposed variable

$$VTRCS = VTRCS(-1) \quad (6.68)$$

Unit: £m **Source:** ONS **Identifier:** IQKI+BKSG+BKSH

Child tax credit (CTC)

Model equation: Imposed variable

$$CTC = CTC(-1) \quad (6.69)$$

Unit: £m **Source:** ONS **Identifier:** MDYL

NPISH tax credits (NPISHTC)

Model equation: Imposed variable

$$NPISHTC = NPISHTC(-1) \quad (6.70)$$

Unit: £m **Source:** ONS **Identifier:** CFGW

Working and children's tax credits (WTCCTC)

Model equation: Imposed variable

$$WTCCTC = WTCCTC(-1) \quad (6.71)$$

Unit: £m **Source:** ONS **Identifier:** MDYN

Tax aggregates

Allowance for tax litigation losses (PROV)

Model equation: Imposed variable

$$PROV = PROV(-1) \quad (6.72)$$

Unit: £m **Source:** OBR **Identifier:** N/A

Public sector taxes on income and wealth (PUBSTIW)

Model equation: Technical relationship (identity)

$$PUBSTIW = TYEM + TSEOP + PRT + TCINV + CT + CGT + FCACA + BETPRF + BETLEVY + OFGEM - NPISHTC - TYPCO + PROV - LAEPS \quad (6.73)$$

Unit: £m **Source:** ONS **Identifier:** ANSO

Public sector taxes on production and products (PUBSTPD)

Model equation: Technical relationship (identity)

$$PUBSTPD = (CETAX - BETPRF) + EXDUTAC + XLAVAT + LAVAT - EUVAT - EUOT + TSD + ROCS + TXMIS + RFP + (NNDRA + VEDCO + LAPT + OPT + EUETS) + CIL + ENVLEVY + BANKROLL + RULC \quad (6.74)$$

Unit: £m ***Source:*** ONS ***Identifier:*** NMYE

Public sector current receipts (PSCR)

Model equation: Technical relationship (identity)

$$PSCR = PUBSTIW + PUBSTPD + OCT + CC + INHT + EENIC + EMPNIC + (RCGIM + RLAIM + OSPC) + PSINTR + (RNCG + HHTCG) + LARENT + PCRENT + BLEVY + LAEPS + SWISSCAP \quad (6.75)$$

Unit: £m ***Source:*** ONS ***Identifier:*** JW2O

National Accounts taxes (NATAXES)

Model equation: Technical relationship (identity)

$$NATAXES = PUBSTIW + PUBSTPD + OCT + BLEVY + INHT + LAEPS + SWISSCAP + EENIC + EMPNIC + CC + EUOT + EUVAT \quad (6.76)$$

Unit: £m ***Source:*** ONS ***Identifier:*** GCSU

Public sector totals

This group covers expenditure and receipts relating to Public Corporations, capital consumption split by CG, LA and PC sectors, the public sector aggregates (including those on current receipts and expenditure, investment and financial transactions), and public sector net wealth.

Gross Operating Surplus of Public Corporations (OSPC)

Model equation: Imposed variable

OSPC= OSPC(-1) *(6.77)*

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *NRJT + JW28*

Public Corp. Interest & Dividends to Private Sector and RoW (DIPCOP)

Model equation: Imposed variable

DIPCOP= DIPCOP(-1) *(6.78)*

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *GZSO*

Public Corporation capital consumption (PCCON)

Model equation: Imposed variable

PCCON= PCCON(-1) *(6.79)*

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *NSRM + JW2C*

Public Corporations change in inventories & valuables (IBPC)

Model equation: Imposed variable

IBPC= IBPC(-1) *(6.80)*

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *DHHL*

Public Corporation onshore corporation tax payments (TYPCO)

Model equation: Imposed variable

$$TYPCO = TYPCO(-1) \quad (6.81)$$

Unit: £m **Source:** ONS **Identifier:** FCCS + JW27

Public corporation net lending to Private Sector and RoW (PCLEND)

Model equation: Imposed variable

$$PCLEND = PCLEND(-1) \quad (6.82)$$

Unit: £m **Source:** ONS **Identifier:** ANRY

Public Corporation miscellaneous expenditure (PCMISE)

Model equation: Imposed variable

$$PCMISE = PCMISE(-1) \quad (6.83)$$

Unit: £m **Source:** ONS **Identifier:** ANRZ

Public corporation accounts received/paid (PCAC)

Model equation: Imposed variable

$$PCAC = PCAC(-1) \quad (6.84)$$

Unit: £m **Source:** ONS **Identifier:** ANVQ + JXJ4

Public corporation adjustment for gilt interest (PCGILT)

Model equation: Imposed variable

$$PCGILT = PCGILT(-1) \quad (6.85)$$

Unit: £m **Source:** ONS **Identifier:** NCXS

Local authority adjustment for gilt interest (LAGILT)

Model equation: Imposed variable

$$LAGILT = LAGILT(-1) \tag{6.86}$$

Unit: £m **Source:** ONS **Identifier:** NCBV

Public Corporation other financial transactions (MFTPC)

Model equation: Imposed variable

$$MFTPC = MFTPC(-1) \tag{6.87}$$

Unit: £m **Source:** ONS **Identifier:** ANVU

Public Sector Current Expenditure (PSCE)

Model equation: Technical relationship (identity)

$$PSCE = (CGWS + CGP + RCGIM + LAWS + LAPR + RLAIM) + (CGTSUB + LATSUB) + (CGSB + LASBHH) + CGNCGA + LANCGA + (CGOTR + LAOTRHH) + (DICGOP + DILAPR + DIPCOP) \tag{6.88}$$

Unit: £m **Source:** ONS **Identifier:** JW2Q

Public Sector depreciation (DEP)

Model equation: Technical relationship (identity)

$$DEP = RCGIM + RLAIM + PCCON \tag{6.89}$$

Unit: £m **Source:** ONS **Identifier:** JW2S

Public Sector Current Budget (PSCB)

Model equation: Technical relationship (identity)

$$PSCB = PSCR - PSCE - DEP \quad (6.90)$$

Unit: £m **Source:** ONS **Identifier:** JW2T

Public Corporation capital grants from Private Sector (KPSPC)

Model equation: Imposed variable

$$KPSPC = KPSPC(-1) \quad (6.91)$$

Unit: £m **Source:** ONS **Identifier:** ADSE

Public Corporation capital grants to Private Sector (KPCPS)

Model equation: Imposed variable

$$KPCPS = KPCPS(-1) \quad (6.92)$$

Unit: £m **Source:** ONS **Identifier:** MIYZ

Public Corporation capital grants from Central Government (KCGPC)

Model equation: Imposed variable

$$KCGPC = KCGPC(-1) \quad (6.93)$$

Unit: £m **Source:** ONS **Identifier:** -ANND-NMGR-NMGT

Public Corporation capital grants from Local Authorities (KGLAPC)

Model equation: Imposed variable

$$KGLAPC = KGLAPC(-1) \quad (6.94)$$

Unit: £m **Source:** ONS **Identifier:** NRJT

Capital grants by Central Government to Private Sector & RoW (KCGPSO)

Model equation: Imposed variable

$$KCGPSO = KCGPSO(-1) \quad (6.95)$$

Unit: £m **Source:** ONS **Identifier:** ANNI

Capital grants by Private Sector & RoW to Central Government (KPSCG)

Model equation: Imposed variable

$$KPSCG = KPSCG(-1) \quad (6.96)$$

Unit: £m **Source:** ONS **Identifier:** ANNN

Capital grants by private sector & RoW to Local Authorities (KGLA)

Model equation: Imposed variable

$$KGLA = KGLA(-1) \quad (6.97)$$

Unit: £m **Source:** ONS **Identifier:** ANNO

Total Capital transfers by Local Authorities (KLA)

Model equation: Imposed variable

$$KLA = KLA(-1) \quad (6.98)$$

Unit: £m **Source:** ONS **Identifier:** NMNL

Capital grants by Central Government to Local Authorities (KCGLA)

Model equation: Imposed variable

$$KCGLA = KCGLA(-1) \qquad (6.99)$$

Unit: £m **Source:** ONS **Identifier:** NMGR+NMGT

Central Government net acquisitions of Non-Produced Non-Financial Assets (NPACG)

Model equation: Technical relationship

$$NPACG = (NPACG(-1) + NPACG(-2) + NPACG(-3) + NPACG(-4))/4 \qquad (6.100)$$

Unit: £m **Source:** ONS **Identifier:** NMFG

Local Authorities net acquisitions of Non-Produced Non-Financial Assets (NPALA)

Model equation: Technical relationship

$$NPALA = (NPALA(-1) + NPALA(-2) + NPALA(-3) + NPALA(-4))/4 \qquad (6.101)$$

Unit: £m **Source:** ONS **Identifier:** NMOD

Public Sector Gross Investment (PSGI)

Model equation: Technical relationship (identity)

$$PSGI = CGI£ + LAI£ + IPC£ + IBPC + DINVCG + (NPACG + NPALA) + (KCGPSO - KPSCG) + (KLA - KGLAPC - KGLA) + (KPCPS - KPSPC) + ASSETSA \qquad (6.102)$$

Unit: £m **Source:** OBR **Identifier:**

Comment: Public sector gross investment is defined as investment gross of depreciation and sales of fixed assets.

Public Sector Fixed Asset Sales (ASSETSA)

Model equation: Imposed variable

$$ASSETSA = ASSETSA(-1) \quad (6.103)$$

Unit: £m **Source:** OBR **Identifier:**

Public Sector Net Investment (PSNI)

Model equation: Technical relationship (identity)

$$PSNI = PSGI - DEP - ASSETSA \quad (6.104)$$

Unit: £m **Source:** ONS **Identifier:** -JW2Z

Comment: Public sector net investment is net of depreciation and assets sales

Total Managed Expenditure (TME)

Model equation: Technical relationship (identity)

$$TME = PSCE + DEP + PSNI \quad (6.105)$$

Unit: £m **Source:** ONS **Identifier:** KX5Q

Central Government Net Borrowing (CGNB)

Model equation: Technical relationship (identity)

$$CGNB = (CGWS + CGP) + CGTSUB + CGSB + CGNCGA + CGCGLA + CGOTR + DICGOP + (CGI£ + NPACG) + DINVCG + (KCGLA + KCGPC) + KCGPSO - KPSCG - (PUBSTIW + TYPCO) - (PUBSTPD - LAPT - CIL) - (OCT + LANNDR) – (INHT + LAEPS + SWISSCAP) - (EMPNIC + EENIC) - CGNDIV - CGINTRA - (RNCG + HHTCG + BLEVY) \quad (6.106)$$

Unit: £m **Source:** ONS **Identifier:** -NMFJ

Local Authority Net Borrowing (LANB)

Model equation: Technical relationship (identity)

$$LANB = (LAWS + LAPR) + LATSUB + LASBHH + LANCGA - CGCGLA + LAOTRHH + DILAPR + (LAI£ + NPALA) - KCGLA + (KLA - KGLAPC) - KGLA - LAPT - (CC - LANNDR) - LAINTRA - LANDIV - LARENT - CIL \quad (6.107)$$

Unit: £m ***Source:*** ONS ***Identifier:*** -NMOE

General Government Net Borrowing (NSA) (GGNB)

Model equation: Technical relationship (identity)

$$GGNB = CGNB + LANB \quad (6.108)$$

Unit: £m ***Source:*** ONS ***Identifier:*** -NNBK

General Government Net Borrowing (CYSA) (GGNBCY)

Model equation: Technical relationship

$$GGNBCY = GGNB \quad (6.109)$$

Unit: £m ***Source:*** ONS ***Identifier:*** -RPZD

Public Corporations Net Borrowing (NSA) (PCNB)

Model equation: Technical relationship (identity)

$$PCNB = DIPCOP + IPC£ + IBPC - (KCGPC + KGLAPC) + (KPCPS - KPSPC) + TYPCO - OSPC - PCNDIV - PCINTRA - PCRENT \quad (6.110)$$

Unit: £m ***Source:*** ONS ***Identifier:*** -CPCM – JW2H

Public Corporation Net Borrowing (CYSA) (PCNBCY)

Model equation: Technical relationship

PCNBCY= PCNB *(6.111)*

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *-RQBN-RPZD*

Public Sector Net Borrowing (NSA) (PSNBNSA)

Model equation: Technical relationship (identity)

PSNBNSA= - PSCB + PSNI *(6.112)*

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *-J5II*

Public Sector Net Borrowing (CYSA) (PSNBCY)

Model equation: Technical relationship

PSNBCY= PSNBNSA *(6.113)*

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *-RQBN-RPZD*

Swap Adjustments (SWAPS)

Model equation: Imposed variable

SWAPS= SWAPS(-1) *(6.114)*

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *CFZG*

CG net borrowing: Maastricht definition (TDEF)

Model equation: Technical relationship (identity)

TDEF= CGNB + LANB + SWAPS *(6.115)*

Unit: *£m* ***Source:*** *ONS* ***Identifier:*** *MDUK*

CG loans & sales of financial assets (CGLSFA)

Model equation: Technical relationship (identity)

$$CGLSFA = (LCGOS + LCGPR) + (CGMISP) \quad (6.116)$$

Unit: £m **Source:** ONS **Identifier:** JW33 + JW34

Public Sector loans & sales of financial assets (PSLSFA)

Model equation: Technical relationship (identity)

$$PSLSFA = CGLSFA + (LALEND + LAMISE) + (PCLEND + PCMISE) \quad (6.117)$$

Unit: £m **Source:** ONS **Identifier:** JW33 + JW34

Local Authorities Accounts Receivable/Payable (LAAC)

Model equation: Imposed variable

$$LAAC = LAAC(-1) \quad (6.118)$$

Unit: £m **Source:** ONS **Identifier:** ANML

Local Authority Miscellaneous financial transactions (LAMFT)

Model equation: Imposed variable

$$LAMFT = LAMFT(-1) \quad (6.119)$$

Unit: £m **Source:** ONS **Identifier:** ANMW

Accruals Adjustment on conventional gilts (CONACC)

Model equation: Imposed variable

$$CONACC = CONACC(-1) \quad (6.120)$$

Unit: £m **Source:** ONS **Identifier:** -GCSW-GCMR

Central Government Miscellaneous Financial Transactions (MFTRAN)

Model equation: Imposed variable

$$MFTRAN = MFTRAN(-1) \quad (6.121)$$

Unit: £m **Source:** ONS **Identifier:** ANRV

CG Accruals Adjustment Residual (CGACRES)

Model equation: Imposed variable

$$CGACRES = CGACRES(-1) \quad (6.122)$$

Unit: £m **Source:** OBR **Identifier:** -

CG Accruals Adjustment (CGACADJ)

Model equation: Technical relationship (identity)

$$CGACADJ = (EXDUTAC + NICAC + INCTAC) + FCACA + CGACRES + (ILGAC + CONACC) + MFTRAN \quad (6.123)$$

Unit: £m **Source:** ONS **Identifier:** ANRT+ANRU+ANRV

Public Sector Accrual Adjustment (PSACADJ)

Model equation: Technical relationship (identity)

$$PSACADJ = CGACADJ + LAAC + LAGILT + LAMFT + PCAC + PCGILT + MFTPC \quad (6.124)$$

Unit: £m **Source:** ONS **Identifier:** JW35 + JW36 + JW37

Public Sector Financial Assets (PSFA)

Model equation: Imposed variable

$$PSFA = PSFA(-1) \qquad (6.125)$$

Unit: £m **Source:** ONS **Identifier:** NKFB+NPUP

Other Public Sector Financial Liabilities (OFLPS)

Model equation: Imposed variable

$$OFLPS = OFLPS(-1) \qquad (6.126)$$

Unit: £m **Source:** ONS **Identifier:** NKIF+NPVQ-NIJI-ACUA

Stock of Index-linked Gilts (market value) (MKTIG)

Model equation: Imposed variable

$$MKTIG = MKTIG(-1) \qquad (6.127)$$

Unit: £m **Source:** ONS **Identifier:** -

Stock of Index-linked gilts excluding linkers (CGGLITS)

Model equation: Imposed variable

$$CGGILTS = CGGILTS(-1) \qquad (6.128)$$

Unit: £m **Source:** ONS **Identifier:** NIJI-MKTIG

Public Sector Financial Liabilities (PSFL)

Model equation: Technical relationship (identity)

$$PSFL = CGGILTS + OFLPS + NATSAV + MKTIG \qquad (6.129)$$

Unit: £m **Source:** ONS **Identifier:** NKIF+NPVQ

Public Sector Tangible Assets (end period) (PSTA)

Model equation: Technical relationship

$$PSTA = PSTA(-1)*ratio(PIF) + 0.5*(PSNI + KCGPC + KGLAPC - KLA - KCGPSO - NPRIVP)*(1 + ratio(GGIDEF)) \quad (6.130)$$

Unit: £m **Source:** ONS **Identifier:** NG4K

Public Net Worth (end period) (PSNW)

Model equation: Technical relationship (identity)

$$PSNW = PSTA + PSFA - PSFL \quad (6.131)$$

Unit: £m **Source:** ONS **Identifier:** CGTY

Central government net lending to rest of world (LCGOS)

Model equation: Imposed variable

$$LCGOS = LCGOS(-1) \quad (6.132)$$

Unit: £m **Source:** ONS **Identifier:** HEUC

Central government net lending to the private sector (LCGPR)

Model equation: Imposed variable

$$LCGPR = LCGPR(-1) \quad (6.133)$$

Unit: £m **Source:** ONS **Identifier:** ANRH-HEUC

Central government net lending to public corporations (LCGPC)

Model equation: Imposed variable

$$LCGPC = LCGPC(-1) \quad (6.134)$$

Unit: £m **Source:** ONS **Identifier:** ABEI

Central government net lending to local authorities (LCGLA)

Model equation: Imposed variable

$$LCGLA = LCGLA(-1) \quad (6.135)$$

Unit: £m **Source:** ONS **Identifier:** ABEC

Local authority net lending to private sector and rest of world (LALEND)

Model equation: Imposed variable

$$LALEND = LALEND(-1) \quad (6.136)$$

Unit: £m **Source:** ONS **Identifier:** ADDU

Local authority market borrowing net of central government/public corporation debt (LABRO)

Model equation: Technical relationship (identity)

$$LABRO = LANB + LALEND + LAMISE + LAAC + LAGILT + LAMFT - LCGLA \quad (6.137)$$

Unit: £m **Source:** ONS **Identifier:** AAZK

Central government net cash requirement (CGNCR)

Model equation: Technical relationship (identity)

$$CGNCR = CGNB + CGLSFA + CGACADJ + LCGLA + LCGPC \quad (6.138)$$

Unit: £m **Source:** ONS **Identifier:** RUUW

Public sector net cash requirement (PSNCR)

Model equation: Technical relationship (identity)

$$PSNCR = PSNBNSA + PSLSFA + PSACADJ \quad (6.139)$$

Unit: £m **Source:** ONS **Identifier:** JW38

Stock of coins (COIN)

Model equation: Technical relationship

$$ratio4(COIN) = ratio4(M0) \quad (6.140)$$

Unit: £m **Source:** ONS **Identifier:** NIIK

Stock of National Savings (NATSAV)

Model equation: Imposed variable

$$NATSAV = NATSAV(-1) \quad (6.141)$$

Unit: £m **Source:** ONS **Identifier:** ACUA

Central government liquid assets (CGLIQ)

Model equation: Imposed variable

$$CGLIQ = CGLIQ(-1) \quad (6.142)$$

Unit: £m **Source:** ONS **Identifier:** BKSM + BKSN

Imputed general government debt from finance leases (FLEASGG)

Model equation: Imposed variable

$$FLEASGG = FLEASGG(-1) \quad (6.143)$$

Unit: £m **Source:** ONS **Identifier:** F8YF + F8YH

Imputed public corporations debt from finance leases (FLEASPC)

Model equation: Imposed variable

$$FLEASPC = FLEASPC(-1) \quad (6.144)$$

Unit: £m **Source:** ONS **Identifier:** F8YJ

Public sector net debt (PSND)

Model equation: Technical relationship (identity)

$$diff(PSND) = PSNCR - ILGAC + diff(FLEASGG) + diff(FLEASPC) + PSNDRES \quad (6.145)$$

Unit: £m **Source:** ONS **Identifier:** BKQK

Local authority liquid assets (LALIQ)

Model equation: Imposed variable

$$LALIQ = LALIQ(-1) \quad (6.146)$$

Unit: £m **Source:** ONS **Identifier:** BKSO + BKQG

General government liquid assets (GGLIQ)

Model equation: Technical relationship (identity)

$$GGLIQ = CGLIQ + LALIQ \quad (6.147)$$

Unit: £m **Source:** ONS **Identifier:** BKQJ – BKSQ – BKSP - AIPD

General government gross debt (GGGD)

Model equation: Technical relationship (identity)

$$diff(GGGD) = CGNCR + LABRO - ILGAC + diff(SRES) + diff(GGLIQ) + GGGDRES \quad (6.148)$$

Unit: £m **Source:** ONS **Identifier:** BKPX

Other changes in public sector net debt (PSNDRES)

Model equation: Imposed variable

$$PSNDRES = PSNDRES(-1) \quad (6.149)$$

Unit: £m **Source:** OBR **Identifier:** -

Other changes in general government net debt (GGGDRES)

Model equation: Imposed variable

$$GGGDRES = GGGDRES(-1) \quad (6.150)$$

Unit: £m **Source:** OBR **Identifier:** -

7 Domestic financial sector

This group covers domestic interest rates, and asset prices and the monetary aggregates. There is no explicit equation that captures the way monetary policy is implemented. The official Bank Rate is imposed. Forecasts made using the model as therefore conditioned on a particular path for monetary policy.

The key interest rate variable is the three-month interbank rate, RS. There are four other identified nominal interest rates: the 20 year gilt yield, RL; the mortgage rate, RMORT; the rate on retail deposits, RDEP and the effective rate charged on business loans, RIC. Equity prices, EQPR, are determined as a function of nominal GDP at current market prices.

The group also includes monetary aggregates: the narrow and broad money aggregates, M0 and M4, are determined by technical relationships, and depend on nominal GDP at current market prices.

Interest rate equations

UK three month inter-bank rate (RS)

Model equation: Imposed variable

$$RS = RS(-1) \qquad (7.1)$$

Unit: Per cent **Source:** BoE **Identifier:** IUQAAMIJ

Comment: This variable is based on the Bank of England's quarter-average 3-month sterling interbank lending rate, and is used a measure of UK banks' short-term wholesale borrowing costs. In the forecast RS is projected in line with Bank Rate, with some allowance for changes in financial market developments and bank funding conditions in the short-term.

UK twenty year gilt yield (RL)

Model equation: Imposed variable

$$RL = RL(-1) \qquad (7.2)$$

Unit: Per cent **Source:** BoE **Identifier:** IUQALNPY

Comment: RL is the quarter-average, 20-year nominal par gilt yield. This is taken directly from the Bank of England dataset in the historic period and derived from the Bank's forward curve in the forecast period.

Household retail deposits effective rate (RDEP)

Model equation: Imposed variable

$$RDEP = RDEP(-1) \qquad (7.3)$$

Unit: Per cent **Source:** BoE **Identifier:** CFMHSCV, CFMHSCW

Comment: The data used for RDEP comes from two Bank of England effective interest rate series: the weighted average rates for sight deposits (CFMHSCV) and time deposits (CFMHSCW). These are combined as an average, weighted by the relative importance of sight and time deposits in households' balance sheets. In the forecast period RDEP is projected primarily as a function of the 3-month interbank rate (RS) and Bank Rate (R), although also allowing for the path of mortgage rates (RMORT) and retail margin (RMORT-RDEP) in the medium-term.

Effective average mortgage rate (RMORT)

Model equation: Imposed variable

$$RMORT = RMORT(-1) \quad (7.4)$$

Unit: Per cent **Source:** BoE **Identifier:** HSDE

Comment: RMORT is the average rate paid on all UK household mortgages (of all contractual terms). In the historic period this is taken directly from the Bank of England dataset. In the forecast this is projected as a function of short and medium-term bank funding costs (in both wholesale and retail markets), both current and in recent history, to reflect the cost of all the different mortgages banks provide – i.e. fixed-rate and variable rate, for new and existing customers.

Equity price index – FT all-share (EQPR)

Model equation: Technical relationship

$$dlog(EQPR) = dlog(GDPM£) \quad (7.5)$$

Unit: Index **Source:** ONS **Identifier:** HSEL

Comment: Equity prices are assumed to grow in line with nominal GDP.

Effective rate on bank lending to PNFCs (RIC)

Model equation: Technical relationship

$$diff(RIC) = 0.95*diff(RS) - 0.25*(RIC(-1) - RS(-1) - 1.9) \quad (7.6)$$

Unit: Per cent **Source:** BoE **Identifier:** CFMHSDC

Comment: RIC represents the average rate paid by PNFCs on bank loans. The historic series is taken directly from the Bank of England dataset.

Monetary aggregates equations

Notes & coins in circulation outside BoE (M0)

Model equation: Technical relationship

$$dlog(M0) = dlog(GDPM£) \quad (7.7)$$

Unit: £m **Source:** ONS **Identifier:** AVAB

Comment: Following reforms to the Bank of England's money market operations, production of M0 data discontinued from May 2006. Hence narrow money i.e. M0, is defined here as notes and coins in circulation outside the Bank of England and excludes banks' operational deposits that were formerly included in M0.

Holdings of M4 by PNFCs (M4IC)

Model equation: Technical relationship

$$ratio(M4IC) = ratio(GDPM£) \quad (7.8)$$

Unit: £m **Source:** ONS **Identifier:** VQSH

Holdings of M4 by OFCs (M4OFC)

Model equation: Imposed variable

$$M4OFC = M4OFC(-1) \quad (7.9)$$

Unit: £m **Source:** ONS **Identifier:** VQSJ

The Broad money aggregate (M4)

Model equation: Technical relationship (identity)

$$M4 = DEPHH + M4IC + M4OFC \quad (7.10)$$

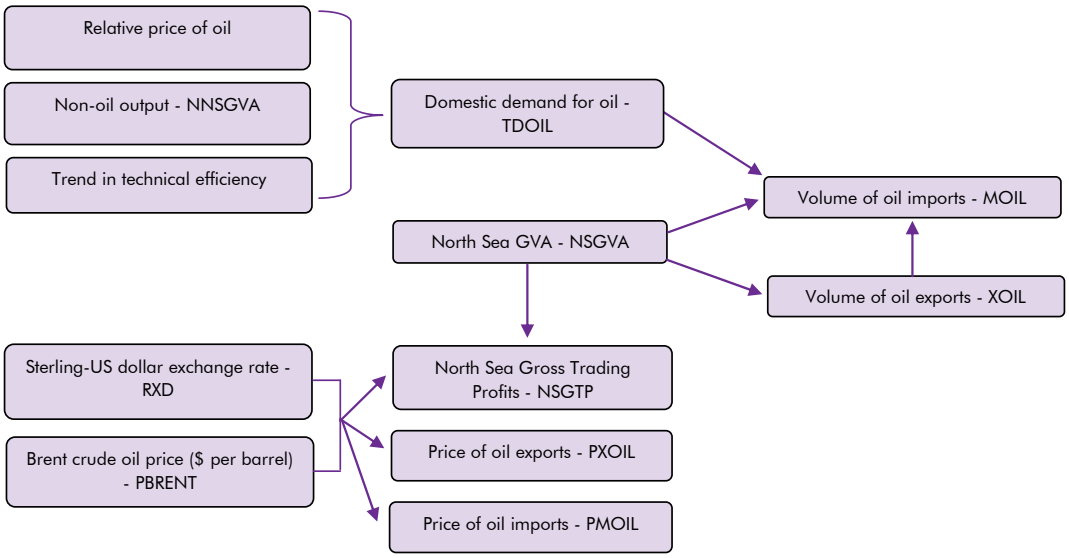
Unit: £m **Source:** ONS **Identifier:** AUYN

Comment: The total stock of M4 deposits is defined as the sum of households', PNFCs' and OFCs' deposits.

8 North Sea

In this group, production and trade are considered at an aggregate level. Trade flows of oil in volume terms are determined by assuming that exports, XOIL, can be modelled as a fixed proportion of output of North Sea oil. Import volumes, MOIL, are determined as the residual of the demand and supply identity i.e. the equation is essentially one for net oil trade.

Figure 8.1: The North Sea



Total domestic demand for oil (TDOIL)

Model equation: Behavioural equation

$$\begin{aligned} log(TDOIL) = \; & log(TDOIL(-1)) - \underset{(4.6)}{0.23}*log(TDOIL(-1)/NNSGVA(-1)) \\ & - \underset{(3.2)}{0.05}*log(PBRENT/(PNNSGVA*RXD)) \\ & + \underset{(2.1)}{1.06}*log[NNSGVA(-1)/NNSGVA(-2)] \\ & - \underset{(3.9)}{0.0014}*time(197001) \\ & + \underset{(2.4)}{0.08}*(ifge(198401)*ifle(198501)) - \underset{(4.1)}{0.60} \\ & - \underset{(4.6)}{0.23}*(ifeq(198601) - ifeq(198602)) \end{aligned} \qquad (8.1)$$

Unit: £m, CVM **Source:** ONS **Identifier:** ABMM – KLS2 + BPIX – BOXX

Equation properties

Estimation period: 1972Q1 to 2005Q3.

Adjusted R^2 = 0.34

Static long-run solution:

$$\begin{aligned} log(TDOIL) = \; & log(NNSGVA) - 0.23*log(PBRENT/(PNNSGVA*RXD)) \\ & - 0.0014*T \end{aligned}$$

Elasticity of TDOIL with respect to a 1% increase in:

	Q1	Q5	Q5	Long-run
Relative Prices (PNNSGVA)	-0.00%	-0.16%	-0.20%	-0.23%
Output (NNSGVA)	0.00%	1.13%	1.13%	1.00%

Comment: This equation models domestic demand for oil in terms of the relative price of oil, an activity indicator (Non-North Sea GVA) and a negative time trend to capture greater technological efficiency in the use of oil. The time trend implies an exogenous reduction in the demand for oil of about 0.6 per cent per annum.

GVA in North Sea oil and gas extraction (NSGVA)

Model equation: Imposed variable

$$NSGVA = NSGVA(-1) \quad (8.2)$$

Unit: £m, CVM **Source:** ONS **Identifier:** ABMM – KLS2

Comment: The Department for Energy and Climate Change produces medium-term projections for oil output.

Exports of oil, in volume terms (XOIL)

Model equation: Technical relationship

$$XOIL = 1.37*NSGVA \quad (8.3)$$

Unit: £m, CVM **Source:** ONS **Identifier:** BOXX

Comment: Oil exports are calibrated as a proportion of output, based on the latest figures (2013 Q1).

Price index for exports of oil (PXOIL)

Model equation: Technical relationship

$$log(PXOIL) = log\ (100 * PBRENT/(OILBASE*RXD)) \quad (8.4)$$

Unit: Index **Source:** ONS **Identifier:** 100*(ELBL/BOXX)

Imports of crude oil and oil products (MOIL)

Model equation: Technical relationship (identity)

$$MOIL = TDOIL + XOIL - NSGVA \quad (8.5)$$

Unit: £m, CVM **Source:** ONS **Identifier:** BPIX

Comment: Oil imports are determined as a residual given domestic demand, exports and North Sea GVA.

Price index for imports of oil (PMOIL)

Model equation: Technical relationship

$$log(PMOIL) = log\ (100 * PBRENT/(OILBASE*RXD)) \quad (8.6)$$

Unit: Index **Source:** ONS **Identifier:** 100*(ENXO/BPIX)

North Sea Gross Trading Profits: PNFCs (NSGTP)

Model equation: Technical relationship

$$ratio(NSGTP) = ratio((NSGVA) *ratio(PBRENT)/ratio(RXD)) \quad (8.7)$$

Unit: £m **Source:** ONS **Identifier:** CAGD

Brent crude oil price, in dollars per barrel (PBRENT)

Model equation: Imposed variable

$$PBRENT = PBRENT(-1) \quad (8.8)$$

Unit: $ **Source:** DST **Identifier:** OILBREN

Sterling price of Brent in base year, 2009 (OILBASE)

Model equation: Technical relationship

$$OILBASE = PBRENT(200901)/RXD(200901) + PBRENT(200902)/RXD(200902) + PBRENT(200903)/RXD(200903) + PBRENT(200904)/RXD(200904) \quad (8.9)$$

Unit: Index **Source:** ONS **Identifier:** OILBREN/RXD

Comment: OILBASE is used to normalise Sterling oil prices.

Price index of non-oil GVA (PNNSGVA)

Model equation: Technical relationship

$$PNNSGVA = (GDPM£(-1) - BPA£(-1) - NSGVA(-1)*PBRENT(-1)/(OILBASE*RXD(-1)))/NNSGVA(-1) \quad (8.10)$$

Unit: Index **Source:** OBR, ONS **Identifier:** N/A

A Glossary of Winsolve notations

dlog(X) =	$\log(X_t) - \log(X_{t-1})$
diff(X) =	$X_t - X_{t-1}$
distlag(X, n, w_1,..., w_i) =	n-period distributed lag of variable X with weights (w_1,..., w_i)
d4log(X) =	$\log(X_t) - \log(X_{t-4})$
ifge(t) =	dummy variable taking the value 1 when T≥t
ifle(t) =	dummy variable taking the value 1 when T≤t
ratio(X) =	X_t/X_{t-1}
ratio4(X) =	X_t/X_{t-4}
time(t)=	linear time trend taking the value 1 in period t
X^i =	X^i
X =X(-1)	denotes an Imposed variable and not an AR(1) process.

Where X represents a model variable and T is time.

B Winsolve model code

This Annex sets out the macroeconomic model code in full. The supporting code file is available on request. The model code is provided to users for their use based on their own assumptions. As such results produced by the model do not constitute the views of the OBR or the Treasury, nor are they to be regarded as OBR or Treasury forecasts. The model code is set out and provided 'as is', without any representation or endorsement made and without warranty of any kind. We do not warrant that the functions contained in the model are error free, and in no event will be liable for any loss or damage whatsoever arising from its use.

```
@ WinSolve code for OBR/HMT macroeconomic model 2013

{


Format for Equation comments (with column markers):
1  4                                                    61        71       80
*C --------->                                       <--------     <----  <------
*C Total interest payments of HH (&NPISH)             ROYU    TA37,EA   NV1005
   DESCRIPTION                                    IDENTIFIER    SOURCE   UPDATE

SOURCE codes for tables:

BB  Blue Book
PB  Pink Book
EA  Economic Accounts
FS  Financial Statistics
ET  Economic Trends
MD  Monthly Digest of Statistics
AA  Annual Abstract of Statistics
QA  Quart. Natl Accounts 1st release
LM  Labour Market Stats 1st release
BP  Balance of Payments 1st release
TD  UK Trade 1st release
PF  Public Sector Finances 1st release
CS  Capital Stocks

}


{======== Model setup ============================================================}
{
*W  Denotes a Working variable
*P  Denotes a model Parameter
*M  Denotes Multiplicative adjustments
*A  Denotes Additive adjustments
*I  Denotes an identity equation
}
*W Q1 = seas(1) ;    { 1,0 seasonal dummies }
*W Q2 = seas(2) ;
*W Q3 = seas(3) ;
*W Q4 = seas(4) ;

*C £ price of brent (PBRENT/RXD) in base year (2009)         ----   =HMT  SF1011

OILBASE = ( (obs(PBRENT,200901)/obs(RXD,200901)) + (obs(PBRENT,200902)/obs(RXD,200902))
          + (obs(PBRENT,200903)/obs(RXD,200903)) + (obs(PBRENT,200904)/obs(RXD,200904))
)/4 ;
```

```
*C Taxes less subsidies on production in base year           ----   =HMT  SF1011

TPRODBASE  = (obs(TPROD£,200801) + obs(TPROD£,200802)
            + obs(TPROD£,200803) + obs(TPROD£,200804))/4 ;

*C Taxes less subsidies on production in base year           ----   =HMT  SF1011

TXFUELBASE = (obs(TXFUEL,200801) + obs(TXFUEL,200802)
            + obs(TXFUEL,200803) + obs(TXFUEL,200804))/4 ;

*C GVA in latest base year (2008)                            ----   =HMT  SF1011

GVABASE = (obs(GVA,200801) + obs(GVA,200802)
         + obs(GVA,200803) + obs(GVA,200804))/4 ;


{======== Group 01: Consumption ================================================}

*C HH (&NPISH) final consumption expenditure             ABJR+HAYO   T2.5,ET   DG0304

*W RLY = 100*(FYEMP + MI - EMPSC - EESC + SBHH - TYWHH + CGOTR

                    + EECOMPC - EECOMPD - GNP4)/PCE ; {real labour income}

dlog(C) = - 0.12916*log(C(-1)/RLY(-1)) - 0.10513*dlog(C(-1))

        + 0.005062*log(100*NFWPE(-1)/(PCE(-1)*RLY(-1)))

        + 0.194530*dlog(RHHDI) + 0.089182*dlog(RHHDI(-1))

        - 0.138360*dlog(RHHDI(-2)) + 0.14614*(dlog(GPW)-dlog(PCE))

        - 0.008354*diff(UNUKP) - 0.000732*diff(RS) + 0.019706 {0.013403}

        + 0.000335*time(198501)*ifle(199002)
        - 0.000107*time(198501)*ifge(199003)

        - 0.21904*(((100*LHP(-1)*((1+RHF(-1)/100)^.25 - 1)/PCE(-1))/RHHDI(-1))
                - ((100*LHP(-2)*((1+RHF(-2)/100)^.25 - 1)/PCE(-2))/RHHDI(-2)))

        + 0.039784*(ifeq(197902)-ifeq(197903));

*C Nominal HH (&NPISH) final consumption expenditure       RPQM   T2.5,ET   NV0206

C£ = C*PCE/100 ;

*C HH final consumption expenditure: durable goods (CVM)  UTID    TA7,EA   DG1009

*W CDUC = PCDUR*( (((1 + R/100)^0.25) - 1) + ((1.25^0.25)-1) - diff(PCDUR)/PCDUR ) ;

*W RPCDUR = (PCDUR/PCE) ;

CDUR = C*(0.81848*(CDUR(-1)/C(-1)) + 0.010321*log(RHHDI) + 0.0021463*log(NFWPE/PCE)

+ 0.0025645*log(PD) + 0.0040243*log(CDUC) - 0.0048541*log(CDUC(-1)) -
0.023153*log(RPCDUR)

- 0.0001559*time(197701) - 0.12233) ;

*C HH final consumption expenditure: durable goods (£m)   UTIB    TA7,EA   NV1106

CDUR£ = (PCDUR/100)*CDUR ;

*C Numbers in age cohort 20-29                            KABB   T5.3,AA   NV0906

A2029 = A2029(-1) ;

*C Property transactions                                  FTAQ   T5.5,ET   DS0813

dlog(PD) = -0.1072452*log(PD(-1))  + 0.2518946*log(RHHDI)

            - 0.2226329*log(APH(-1)/PCE(-1))

            - 0.00207*(RMORT(-1) - 400*dlog(APH(-1)))

            + 9.074532*dlog(A2029(-1)) -2.418686  - 0. 2636794*ifeq(200803)

            + 0.2197351*(ifeq(199203) -ifeq(199204))  +  0.3479004*ifeq(200401)
```

```
            - 0.1293539*ifeq(200501) + 0.1590457*(ifeq(200904) -ifeq(201001)) ;

{======== Group 02: Inventories ================================================}
*C Inventory levels                                      ----    TA9,EA   NV0206
INV = INV(-1) + DINV ;
*C Change in inventories                                 CAFU    TA2,EA   NV0206
DINV = DINV(-1) ;
*C Book Value of inventories                              HMT    TA9,EA   NV0206
BV =  INV*PINV/100 ;
*C Stock appreciation                                DLRA+EQCB     TC,BB   NV0206
SA = BV(-1)*(PINV/PINV(-1)-1) ;
*C Change in inventories                                 CAEX    TA2,EA   NV0206
DINV£ = DINV*PINV/100 ;
*C Change in inventories of HH and NPISH                 RPZX   TA41,EA   TP0813
DINVHH = 0.07*DINV£ ;
*C Change in inventories of Central Govt.                ANMY  PSAT2,PF   NV0707
DINVCG = DINVCG(-1) ;

{======== Group 03: Investment ================================================}
*C Rate of annual writing down allowance for industrial buildings  HMRC   DS0312
SIB = SIB(-1) ;
*C Rate of initial-year allowances for industrial buildings        HMRC   DS0312
IIB = IIB(-1) ;
*C Rate of annual writing down allowance for plant                 HMRC   DS0312
SP = SP(-1) ;
*C Rate of first-year allowances for plant                         HMRC   DS0312
FP = FP(-1) ;
*C Rate of annual writing down allowance for vehicles              HMRC   DS0312
SV = SV(-1) ;
*C Discount factor                                          HMT     -----   DS0312
DISCO = DISCO(-1) ;
{PRESENT VALUE OF DEPRECIATION ALLOWANCES}
*C  Present value of depreciation allowances for buildings        HMT     -----   DS0312
DB= ifle(201101)*1/(1+DISCO)*(IIB+(SIB/DISCO)*(1-(1+DISCO)^((-1)*(1-IIB)
    /(SIB+0.1*ifge(201102))))) ;
*C Present value of depreciation allowances for plant             HMT     -----   DS0312
DP=1/(1+DISCO)*((DISCO*FP+SP)/(DISCO+SP)) ;
*C Present value of depreciation allowances for vehicles          HMT     -----   DS0312
DV=1/(1+DISCO)*SV/(DISCO+SV) ;
```

```
{TAX-ADJUSTMENT FACTORS}
*P  WB = 0.31 ; {Investment share buildings}
*P  WP = 0.54 ; {Investment share plant}
*P  WV = 0.14 ; {Investment share vehicles}
*C Tax-adjustment factor for buildings                          HMT     -----   DS0312
TAFB = (1-TCPRO*DB)/(1-TCPRO) ;
*C Tax-adjustment factor for plant                              HMT     -----   DS0312
TAFP = (1-TCPRO*DP)/(1-TCPRO) ;
*C Tax-adjustment factor for vehicles                           HMT     -----   DS0312
TAFV=(1-TCPRO*DV)/(1-TCPRO) ;
*C Tax-adjustment factor for private sector                     HMT     -----   DS0312
TAF=WB*TAFB+WP*TAFP+WV*TAFV ;

{CALCULATION OF COST OF FINANCE}
*P  WG = 0.03 ; {Annual dividend growth}
*C Weight on debt finance                                                       DS0312
DEBTW = DEBTW(-1) ;

*C Dividend yield of UK non-financials              NETZ/NLBU (A5GA)    DS0312
NDIV = NDIV(-1)  ;
*C Cost of debt finance
CDEBT = CDEBT(-1) + diff(RIC)  ;
*C Cost of equity finance
CEQUITY = NDIV*(1+WG) + 100*WG ;
*C Real weighted average cost of finance
RWACC = DEBTW*CDEBT + (1-DEBTW)*CEQUITY  ;

{UNADJUSTED COST OF CAPITAL}
*C Rate of depreciation
DELTA=DELTA(-1) ;
*C Unadjusted real cost of capital
COCU  =  PIBUS/PGDP*obs(PGDP,197001)/obs(PIBUS,197001)*(DELTA+RWACC) ;

*C TAX-ADJUSTED REAL COST OF CAPITAL                    HMT     -----   DS0312
COC=TAF*COCU ;

*C Optimal capital
KSTAR = exp(log(MSGVA) - 0.4*log(COC)+ 2.5887275) ;
{2.58... scales KSTAR to KMS in 2006}

*C Gap between capital stock and optimal level of capital
```

```
KGAP = log(KMS*1000)-log(KSTAR) ;

*C Business investment                                    NPEL   T2.7,ET   DS0712
IBUS = IBUSX + 17394*ifeq(200502)  ;
*C Business investment ex. BNFL transfer to CG            GAN8   DS0712

dlog(IBUSX) = 0.1434383*dlog(IBUSX(-3)) + 0.1623894*dlog(IBUSX(-4))
              + 1.038498*dlog(MSGVA(-1)) - 0.0009011*CBIUD
              - 0.078365*(log(IBUSX(-1)) - log(KMS(-2)*1000)
              + KGAP(-2)) + 0.0537238*(ifeq(201004)-ifeq(201101))
              - 0.110963*(ifeq(198501)-ifeq(198502)) -0.2594887 ;

*C CBI factors reducing investment- uncertainty over demand CBI     ----    DS0712
CBIUD = - 163.937*dlog(MSGVA(-1))
        + 0.4375033*CBIUD(-1) + 0.2909636*CBIUD(-2) + 14.67938 ;


*C General Government GFCF                    RPZG(RNCZ+RNSM)    TA8,EA   NV0206
GGI£ = CGI£ + LAI£ ;
*C General Government gross fixed capital formation      DLWF    TA8,EA   NV0206
GGI = 100*GGI£/GGIDEF ;
*C General Government GFCF inc. BNFL transfer to CG              DS2308
GGIX = GGI + 17394*ifeq(200502) ;
*C General Government investment deflator     100*(RPZG/DLWF)    TA8,EA   NV0206
ratio(GGIDEF) = ratio(PIF) ;
*C Private sector investment in dwellings                L636    TA8,EA   DS0713
dlog(IH) = - 0.2628721*log(IH(-1)) + 0.0214637*log(APH(-1)/PCE(-1))
           -0.001359*(RS(-1) - 400*dlog(APH(-1)))
           + 0.076166*log(PD(-1)*0.845) - 0.1372628*dlog(IH(-1))
           + 2.066232 ;

*C Public Corporation investment in dwellings            L634    TA8,EA   NB0106
ratio(PCIH) = ratio(IH) ;
*C Net acquisitions of valuables                         NPJR    TA2,EA   NV0106
VAL = VAL(-1) ;
*C Net acquisitions of valuables                         NPJQ    TA2,EA   NV0106
VAL£ = VAL*PIF/100 ;
*C HH Net acquisitions of valuables                      RPZY   TA41,EA   NV0106
VALHH = 0.25*VAL£ ;
*C PC investment in existing buildings & transfer costs  L635    TA8,EA   NV0308
```

```
PCLEB = PCLEB(-1) ;
*C Private sector investment in existing buildings       L637    TA8,EA   NV0308
IPRL  = IPRL(-1) ;
*C Total gross fixed capital formation (CVM)             NPQT    TA8,EA   NV0106
IF = IBUS + GGI + PCIH + PCLEB + IH + IPRL ;
*C Total gross fixed capital formation (£m)              NPQS    TA8,EA   NV0106
IF£ = IF*PIF/100 ;
*C HH net acquisitions of non-produced non-fin. assets   RPZU   TA41,EA   NV0106
NPAHH = NPAHH(-1) ;

*C Gross fixed capital formation by HH&NPISH             RPZW   TA41,EA   AT1011
*w PIH = APH*0.5816 ;
*W PIPRL = APH*0.6542 ;
*W PIPC = PIF*0.9828 ;
IHH£ = 0.9711*(PIH/100)*IH + 0.5258*(PIPRL/100)*IPRL + 0.0802*(PIBUS/100)*IBUS ;

*C Business investment deflator                                ----    HMT     AT1011
PIBUS = 100*(IF£ - (PIH/100)*IH - (PIPRL/100)*IPRL - (PIPC/100)*(PCIH + PCLEB) -
GGI£)/IBUS ;

'See N/WINXSOLVE/HMTMODEL/GROUP03/IHH£_ICC£_IPC£.xls
*C Gross fixed capital formation by PNFCs                ROAW   TA22,EA   AT1011
ICC£ = 0.0248*(PIH/100)*IH + 0.2340*(PIPRL/100)*IPRL + 0.8185*(PIBUS/100)*IBUS ;
*C GFCF & net acquisition of land: PCs                   ANNQ  PSAT2,PF   AT1011
IPC£ = (PIPC/100)*(PCIH + PCLEB) + 0.0354*(PIBUS/100)*IBUS ;
*C Gross fixed capital formation by FINCOs               RPYQ   TA26,EA   AT1011
IFC£ = IF£ - IHH£ - ICC£ - LAI£ - CGI£ - IPC£ ;
{======== Group 04: The Labour Market ========================================}
*C General Government Employment                         G6NW             DH0813
EGG = EGG(-1) ;
*C Central Government employment                         G6NQ     T4,LM   DH0813
ratio(ECG) = ratio(EGG) ;
*C Local Authority employment                            G6NT     T4,LM   DH0813
ratio(ELA) = ratio(EGG) ;
*C Private sector employment (WFJ)                       ----      =HMT   NV0206
dlog(EPS) = + log((ET - ECG - ELA)/
                  (ET(-1) -ECG(-1) -ELA(-1))) ;
*C Market sector employment (LFS)    MGRZ-G6NQ-G6NT-MGRT-MGRW     T1,LM   DH0813
EMS = EMS(-1)*(ETLFS-ECG-ELA)/(ETLFS(-1)-ECG(-1)-ELA(-1)) ;
*C Employed labour force (WFJ)                           ----      =HMT   NV0206
ET = ET(-1)*ratio(ETLFS) ;
*C Work related govt training programmes                 LOJU     T5,LM   NV0206
```

```
WRGTP = WRGTP(-1)*ratio(ET) ;
*C Employed labour force (WFJ)                              DYDC     T5,LM   NV0206
WFJ = ET + WRGTP ;
*C Total LFS employment inc. self-employed                  MGRZ     T1,LM   NV0807
ETLFS = 1000*(HWA/AVH) ;
*C Employers & self-employed (WFJ)                          DYZN     T5,LM   NV0206
ratio(ES) = ratio(ET) ;
*C Employers & self-employed (LFS)                          MGRQ     T3,LM
ratio(ESLFS) = ratio(ES) ;
*C ONS 2010 population projection: children (<16)           =ONS     DH0813
GAD1 = GAD1(-1) ;
*C ONS 2010 population projection: working-age              =ONS     DH0813
GAD2 = GAD2(-1) ;
*C ONS 2010 population projection: state pension age        =ONS     DH0813
GAD3 = GAD3(-1) ;
*C ONS 2010 population projection: total                    =ONS     DH0813
GAD = GAD1 + GAD2 + GAD3 ;
*C Population of 16+ (LFS)                                  MGSL     T1,LM
ratio(POP16) = (GAD2+GAD3)/(GAD2(-1)+GAD3(-1)) ;
*C LFS unemployment (ILO)                                   MGSC     T1,LM   NV0206
ULFS  = ((POP16*PART16/100)-ETLFS) ;
*C LFS unemployment rate                                    MGSX     T1,LM   NV0206
LFSUR = 100*ULFS/(ETLFS+ULFS) ;
*C Claimant count unemployment                              BCJD    T1A,LM   NV1108
dlog(U) = 0.5716587*dlog(U(-1)) - 1.361356*dlog(GDPM) - 1.385637*dlog(GDPM(-1))
        - 0.9276604*dlog(GDPM(-2)) - 0.012263*log(U(-1)) - 0.025383*log(GDPM(-1))
        + 0.0137341*ifge(198301)*ifle(198304) - 0.009931*ifge(198601)*ifle(198604)
        - 0.0225585*ifge(199601)*ifle(199604) - 0.0114154*ifge(197902)*ifle(198001)
        + 0.4250975 ;

*C Claimant count unemployment rate                         BCJE    T1A,LM   NV0206
UNUKP = 100*U/(U + WFJ) ;
*C Total hours worked                                       YBUS    NV0807
H16 = H16(-1) ;
*C Total hours worked                                              NV0807
HWA = H16 ;
*C Non-oil productivity per hour                ----         OBR    NV0807
PRODH = NNSGVA/HWA ;
*C Average weekly hours, all workers            YBUV     T7,LM   NV1006
```

```
AVH = AVH(-1) ;
*C 16+ activity rate                              MGWG     T7,LM   NV0807
PART16 = 100*(ULFS+ETLFS)/POP16 ; {PART16 fixed over forecast}
*C 16+ employment rate                            MGSR     T7,LM   NV0807
ER = 100*ETLFS/POP16 ;
{======== Group 05: Exports of goods & services ==============================}
*C Real MTIC related exports                    BQKQ-BQHR           RA0107
XMTIC = XMTIC(-1) ;
*C Nominal MTIC related exports                 IKBH-IKBB-BQHP          RA0107
XMTIC£ = XMTIC£(-1);
*C Exports of non-oil goods ex. MTIC, CVM    BQHR-BOXX          T1&3,TD   DS0911
dlog(XNOX) =   0.637561 *dlog(MKTGS)  - 0.2402681*dlog(XNOX(-1))
              -0.2422665*dlog(RPRICE(-1)) +0.0306296*(ifeq(200602)
             -ifeq(200603))- 0.0649135*(log(XNOX(-1)) - log(MKTGS(-1))
             + 0.741832*log(RPRICE(-1))) +  0.623719 ;

*C Relative export prices                                    CTPC        DS0713
RPRICE = RPRICE(-1) ;

*C Exports of services, CVM                              IKBE,EA T10      DS0911

dlog(XS) = 0.4121483 *dlog(MKTGS(-1)) -0.3153823 *dlog(XS(-1))
          +0.1311732 *dlog(OTLROW(-4))-0.0396418*(ifeq(200103)-ifeq(200104))
          -0.0807357 *(ifeq(199101)) -0.0877155 *(log(XS(-1))
          + 0.467817*log(PXS(-1)*RXD(-1)/MAJCP(-1))-log(MKTGS(-1)))+0.4974978 ;

*C Total exports, CVM ex MTIC               BQHR+IKBE         TA2,EA   NV0206
XX  =  XNOX + XS + XOIL ;
*C Total exports, CVM                                          IKBK      TA2,EA
AT0110
X = XNOX + XS + XOIL + XMTIC ;
*C Total exports, current prices                           IKBH      TA2,EA  AT0110
X£ = (PXNOX/100)*XNOX + (PXS/100)*XS + (PXOIL/100)*XOIL + XMTIC£ ;
*C Consumer prices in the US, Canada, Japan and the euro area  ----      =OBR   DS0713
MAJCP = MAJCP(-1) ;
*C GDP in the US, Canada, Japan and the euro area        ----      =OBR   DS0713
MAJGDP = MAJGDP(-1) ;
*C UK export markets for goods & services                ----      =OBR   DS0713
MKTGS = MKTGS(-1) ;
{======== Group 06: Imports of goods & services ==============================}
*C Trend specialisation in world trade & ind. production ----      =OBR   NV0206
SPECX = SPECX(-1) ;
```

```
*C Real MTIC related imports            BQKO-BQHS                  T13.1,TD   RA0107

MMTIC = XMTIC ;

*C Nominal MTIC related imports         IKBI-IKBC-BQHQ                      T13.1,TD
RA0107

MMTIC£ = XMTIC£ ;


*C index of final demand weighted by import intensity (goods)              HMT     DS0911

MGTFE = 0.154*C + 0.075*CGG + 0.239*IF + 0.406*DINV + 0.311*XNOX + 0.060*XS ;

*C Deflator for goods import-weighted TFE

PMGREL = PMNOX/(0.154*PCE + 0.075*GGFCD + 0.239*PIF + 0.406*PINV + 0.311*PXNOX +
0.060*PXS) ;


*C Imports of non-oil goods CVM ex. MTIC     BQHS-BPIX      13.1,TD   DS0513

dlog(MNOX) = 1.439812*dlog(MGTFE) - 0.1064071*(log(MNOX(-1))

            - log(MGTFE(-1)) + 0.3161924*log(PMGREL(-1))

            - 0.5186771*log(SPECX(-1))) - 0.0551063 ;

*C index of final demand weighted by import intensity (services)   HMT     DS0911

MSTFE = 0.058*C + 0.034*CGG + 0.051*IF + 0.054*DINV + 0.028*XNOX + 0.086*XS ;

*C Deflator for services import-weighted TFE                       HMT     DS0911

PMSREL = PMS/(0.058*PCE + 0.034*GGFCD + 0.051*PIF + 0.054*PINV + 0.028*PXNOX +
0.086*PXS) ;


*C Imports of services, CVM             IKBF                       TA10,EA HMT   DS0911

dlog(MS) = 1.339077*dlog(MSTFE) -0.4727315*dlog(PMSREL)

        -0.1585702*dlog(MS(-1)) -0.0628326*(ifeq(199101))

        -0.178715*(log(MS(-1)) -log(MSTFE(-1)) -0.6729822*log(SPECX(-1))

         + 1.108318*log(PMSREL(-1))) + 0.1524282  ;

*C Total imports, CVM ex. MTIC                BQHS+IKBF           T13.1,TD   AT0110

MX = MNOX + MS + MOIL ;

*C Total imports, CVM                         IKBL    TA2,EA           AT0110

M = MNOX + MS + MOIL + MMTIC ;

*C Total imports at current prices            IKBI    T1,TD            AT0110

M£ = MNOX*(PMNOX/100) + MS*(PMS/100) + MOIL*(PMOIL/100) + MMTIC£ ;

{======== Group 07: Prices and Wages ========================================}

*C Union Density                                          ----      =HMT   NV0706

UDEN = UDEN(-1) ;
```

```
*C Private sector union density                          ----      =HMT   SF0111
PSUDEN = PSUDEN(-1);
*C Private sector average earnings index (inc. bonus)    KAC4    T46,ET   SF 0111
dlog(PSAVEI) =  -0.213*log((PSAVEI(-1)*(1 + (EMPSC+NIS)/WFP))
             /((PGVA(-1))*(GVA(-1)/EPS(-1))))
             + 0.529*dlog(PGVA) + 0.182*dlog(PGVA(-1))
             + 0.091*dlog(PGVA(-2))
             + (1 - 0.529 - 0.182 - 0.091)*dlog(PGVA(-3))
             - 0.015*dlog(LFSUR) - 0.013*log(LFSUR(-1))
             + 0.272*(dlog(GVA)- dlog(EPS))
             + 0.030*log(UDEN) + 0.097*(dlog(PRXMIP)-dlog(PGVA))
             - 0.035*(log(1 - (TYEM(-3)+EENIC(-3))/WFP(-3))
            - log(1 - (TYEM(-4)+EENIC(-4))/WFP(-4)))
             - 0.012*(ifge(197504)*ifle(197901)) - 0.390 ;

*C Private sector average earnings index (exc. bonus)       JQEC    T46,ET   SF011
dlog(PSAVEIX) =  -0.173*log((PSAVEIX(-1)*(1 + (EMPSC+NIS)/WFP))
               /((PGVA(-1))*(GVA(-1)/EPS(-1))))
               + 0.513*dlog(PGVA) + 0.201*dlog(PGVA(-1))
               + 0.083*dlog(PGVA(-2))
               + (1 - 0.513 - 0.201 - 0.083)*dlog(PGVA(-3))
               - 0.025*dlog(LFSUR) - 0.008*log(LFSUR(-1))
               + 0.231*(dlog(GVA) - dlog(EPS))
               + 0.006*log(PSUDEN) + 0.105*(dlog(PRXMIP)-dlog(PGVA))
               - 0.016*(log(1 - (TYEM(-3)+EENIC(-3))/WFP(-3))
               - log(1 - (TYEM(-4)+EENIC(-4))/WFP(-4)))
               - 0.012*(ifge(197504)*ifle(197901)) - 0.351 ;

*C CG average earnings index (2000=100)          NMAI/C9K9(Q)       HMT   NV0706
ERCG = ERCG(-1) ;
*C LA average earnings index (2000=100)          NMJF/C9KA(Q)       HMT   NV0706
ERLA = ERLA(-1) ;
*C Time varying coefficient for wages & salaries         ----       HMT   NV0706
ADJW = (WFP - ((52/4000)*(1*ERCG*ECG)+(52/4000)*(1*ERLA*ELA)))/(PSAVEI*(EMS-ES));

*C Private Sector Unit Labour Costs (base year=100)      ----       HMT   NV0706
ULCPS = 0.17910*(PSAVEI*(52/4)*(1 + (EMPSC + NIS)/WFP)*EMS/GVA) ;

*C Market Sector Unit Labour Costs (2009=100)      ----             HMT   AT0412
*C Mkt Sector GVA ex self-employed sector
*W MSGVA£EMP = MSGVA£ - MI ;
```

```
*C Mkt Sector employee income
*W FYEMPMS = FYEMP - CGWS - LAWS ;

ULCMS = 100*1.6715*FYEMPMS*(1 + (MI/MSGVA£EMP) )/MSGVA ;


{=====Base year values for cost index calculations==============}

*C Private Sector unit labour costs in base year (2009)     ----   =HMT  AT0712

ULCPSBASE = (obs(ULCPS,200901) + obs(ULCPS,200902)
            + obs(ULCPS,200903) + obs(ULCPS,200904))/4 ;

*C Market Sector unit labour costs in base year (2009)     ----   =HMT  AT0712

ULCMSBASE = (obs(ULCMS,200901) + obs(ULCMS,200902)
            + obs(ULCMS,200903) + obs(ULCMS,200904))/4 ;

*C Goods import prices in base year (2009)               ----   =HMT AT0712

PMNOXBASE = (obs(PMNOX,200901) + obs(PMNOX,200902)
            + obs(PMNOX,200903) + obs(PMNOX,200904))/4 ;


*C Services import prices in base year (2009)                   ----   =HMT AT0712

PMSBASE = (obs(PMS,200901) + obs(PMS,200902)
            + obs(PMS,200903) + obs(PMS,200904))/4 ;

*C Unit taxes less subs on products in base year (2009)     ----  =HMT  AT0712

TXRATEBASE = ((obs(BPA£,200901)/obs(GVA,200901)) + (obs(BPA£,200902)/
            obs(GVA,200902)) + (obs(BPA£,200903)/obs(GVA,200903))
               + (obs(BPA£,200904)/obs(GVA,200904)))/4 ;

*C Producer Price Index in base year (2009)              ----  =HMT  AT0712

PPIYBASE = (obs(PPIY,200901) + obs(PPIY,200902)
            + obs(PPIY,200903) + obs(PPIY,200904))/4 ;

*C CPI ex rents in base year (2009)                      ----  =HMT  AT0712

CPIXBASE = (obs(CPIX,200901) + obs(CPIX,200902)
            + obs(CPIX,200903) + obs(CPIX,200904))/4 ;


{====== Cost indices ==========}

*C Index of costs: wholesale domestic manufacturing (2009=100)         ----    =HMT
AT0312

MCOST = 36.83*(ULCMS/ULCMSBASE) + 24.64*(PMNOX/PMNOXBASE)

 + 4.04*(PMS/PMSBASE) + 4.85*((PBRENT/RXD)/OILBASE) + 1.01*((BPA£/GVA)/TXRATEBASE)

 + 24.72*(SCOST/100) + 0.47*(CCOST/100) + 3.43*(UTCOST/100) ;


*C Index of costs: Mkt Sector services output (2009=100)        ----    =HMT AT0412

SCOST = 70.54*(ULCMS/ULCMSBASE) + 6.93*(PMNOX/PMNOXBASE)

 + 6.41*(PMS/PMSBASE) + 0.09*((PBRENT/RXD)/OILBASE) + 3.52*((BPA£/GVA)/TXRATEBASE)

 + 9.78*(PPIY/PPIYBASE) + 1.64*(CCOST/100) + 1.09*(UTCOST/100) ;


*C Index of costs: construction output                 ----                 =HMT AT0412

CCOST = 40.25*(ULCMS/ULCMSBASE) + 2.80*(PMNOX/PMNOXBASE)

 + 0.90*(PMS/PMSBASE) + 0.03*((PBRENT/RXD)/OILBASE) + 0.51*((BPA£/GVA)/TXRATEBASE)

 + 27.06*(PPIY/PPIYBASE) + 28.13*(SCOST/100) + 0.34*(UTCOST/100) ;
```

```
*C Index of costs: utilities output                    ----    =HMT AT0412
UTCOST = 14.85*(ULCMS/ULCMSBASE) + 3.04*(PMNOX/PMNOXBASE)
 + 0.51*(PMS/PMSBASE) + 51.52*((PBRENT/RXD)/OILBASE) + 2.90*((BPA£/GVA)/TXRATEBASE)
 + 8.24*(PPIY/PPIYBASE) + 16.00*(SCOST/100) + 2.95*(CCOST/100) ;

*C Index of retail costs                                ----    =HMT AT0312
RPCOST = 13.18*(PMNOX/PMNOXBASE) + 4.07*(PMS/PMSBASE) + 11.56*((BPA£/GVA)/TXRATEBASE)
 + 7.07*(PPIY/PPIYBASE) + 59.96*(SCOST/100) + 0.92*(CCOST/100) + 3.24*(UTCOST/100) ;

*C Index of costs: GFCF                                 ----    =HMT    AT0412
ICOST = 18.40*(PMNOX/PMNOXBASE) + 0.41*(PMS/PMSBASE) + 0.19*((PBRENT/RXD)/OILBASE)
+ 5.63*((BPA£/MSGVA)/TXRATEBASE) + 8.18*(PPIY/PPIYBASE) + 20.76*(SCOST/100) +
46.42*(CCOST/100) ;

*C Index of costs: Goods Exports                        ----    =HMT    AT0113
XGCOST = 15.77*(PMNOX/PMNOXBASE) + 2.92*((BPA£/MSGVA)/TXRATEBASE)
 + 68.46*(PPIY/PPIYBASE) + 12.80*(SCOST/100) + 0.05*(UTCOST/100) ;

*C Index of costs: Services Exports                     ----    =HMT    AT0113
XSCOST = 7.22*(PMS/PMSBASE) + 5.99*((BPA£/MSGVA)/TXRATEBASE)
 + 9.29*(PPIY/PPIYBASE) + 75.39*(SCOST/100) + 1.90*(CCOST/100) + 0.21*(UTCOST/100) ;

{====== Margins ==========}
*C Manufacturing wholesale margins (2009 = 100)         ----   =HMT  AT0412
MKGW = MKGW(-1) ;

*C Service and retail margins (2009 = 100)          ----   =HMT  AT0412
MKR = MKR(-1) ;

{====== Inflation indices ==========}

*C Producer output Price Index ex. taxes              JVZ8     -----   AT0712
PPIY = (MCOST/100)*(MKGW/100)*PPIYBASE ;

*C CPI index ex rent                                  ----     HMT   AT0712
CPIX = (RPCOST/100)*(MKR/100)*CPIXBASE ;

*C World Price of Goods                               ----       HMT   NV0706
WPG = WPG(-1) ;
*C World Price of Basic Materials                     ----       HMT   NV0706
WPBM = WPBM(-1) ;
```

```
{====== Retail price indices ==========}

*C RROSSI: RPIX ex. council tax, rents & depreciation #1 GUMF       HMT   NV0808
RROSSI = RROSSI(-1) ;
*C Housing: Council tax & rates RPI                      DOBR  T18.2,MD   NV0706
PCT = PCT(-1) ;
*C LA gross rent per house per week                      ----       HMT   NV0706
HRRPW = HRRPW(-1) ;
*C Housing: Rent RPI                                     DOBP  T18.2,MD   RM0113
*M PRENT = PRENT(-1)*((0.6*(PCE/PCE(-1)))+(0.16*(HRRPW/HRRPW(-1)))
        + (0.24*(PRP/PRP(-1)))) ;
*C Private Registered Provider rents per house per week  T703,T704 =DCLG  RM0113
PRP = PRP(-1) ;

' Weights for RPI components                                              RM0812
*P W1 = 0.075 ; {Rent:                 CZXD}
*P W2 = 0.041 ; {Council Tax:          CZXF}
*P W3 = 0.056 ; {Housing Depreciation: DOGX}
*P W4 = 0.029 ; {MIPS:                 CZXE}

' Weights for CPI components                                              RM0812
*P W5 = 0.12  ; {OOH:                  xxxx}

' January base year indices for RPI components                            RM0812
*P I1 = 330.9 ; {Rent:                 DOBP}
*P I2 = 318.2 ; {Council Tax:          DOBR}
*P I3 = 288.6 ; {Housing Depreciation: CHOO}
*P I4 = 242.4 ; {MIPS:                 DOBQ}

' January base year indices for consumer prices                           RM0812
*P I7 = 245.8 ; {RPI:                  CHAW}
*P I8 = 234.3 ; {ROSSI:                GUMF}
*P I9 = 245.1 ; {RPIX:                 CHMK}

' December base year indices for consumer prices                          RM0812
*P I10 = 125.0 ; {CPI:                 D7BT}
*P I11 = 120.2 ; {CPIH:                xxxx}
*P I12 = 108.6 ; {OOH:                 xxxx}

*C Consumer prices index including owner occupiers housing         RM0812
CPIH = I11*(((1-W5)*(CPI/I10))+(W5*(OOH/I12))) ;
*C Owner occupied housing (imputed rents for CPIH)                 RM0812
OOH = OOH(-1) ;
```

```
*C Consumer Prices Index                                    D7BT   T3.1,ET   NV0309
CPI = CPI(-1)*((1-W1)*CPIX + W1*PRENT)
            /((1-W1)*CPIX(-1) + W1*PRENT(-1)) ;


*C RPI excluding Mortgage Interest Payments                 CHMK  T18.2,MD   NV0309
PRXMIP = I9*(((1 - (W1 + W2 + W3*ifge(199501))/(1 - W4))*RROSSI)/I8
       + (W1*PRENT/I1 + W2*PCT/I2 + W3*HD/I3)/(1 - W4)) ;

*C Housing: Mortgage Interest Payments RPI                  DOBQ  T18.2,MD   NV0309
*M PRMIPSVR  = (1.020*PRMIPSVR(-1)*RMORTMK)
                         /(RMORTMK(-1)) ;
*M PRMIP  = ifle(200904)*(1.020*PRMIP(-1)*RMORTMK)
                         /(RMORTMK(-1))
       + ifge(201001)*(1.020*PRMIP(-1)*RMORT)
                           /(RMORT(-1)) ;

*C Retail Prices Index (RPI)                                CHAW   T3.1,ET   JW1108
PRSVR = I7*((1 - W4)*PRXMIP/I9 + W4*PRMIPSVR/I4);
PR = I7*((1 - W4)*PRXMIP/I9 + W4*PRMIP/I4);
RPI = ratio4(PR)*100 - 100 ;
{====== GDP(E) Deflators ==========}
*C AVI of exports of non-oil goods ex MTIC   (BQHP*1000-ELBL)/(BQHR*1000-BOXX)   T1&3,TD
NV0706
                                                                                dlog(PXNOX)
= - 0.11818*(log(PXNOX(-1))
           - 0.5565*log(PPIY(-1)) - (1 - 0.5565)*log(WPG(-1)/RXD(-1))
           + 0.002448*time(197001))
           + 0.84175*dlog(PPIY) + (1 - 0.84175)*(dlog(WPG)-dlog(RXD))
           + 0.042225*ifeq(199301) + 0.062791 ;

*C AVI of exports of services               100*(IKBB/IKBE)          TA10,EA   AT0110
ratio(PXS) = ratio(PXNOX) ;
*C AVI of imports of non-oil goods ex MTIC    100*(BQHQ-ENXO)/(BQHS-BPIX)   T1&3,TD
AT0110
*W RCOM = exp(- log(WPG) + 1.13*log(WPBM) + (1 - 1.13)*log(PBRENT)) ;
dlog(PMNOX) = - 0.24762*((log(PMNOX(-1))
           - 0.49616*log(WPG(-1)/RXD(-1)) - (1 - 0.49616)*log(PPIY(-1)))
                                        + 0.002759*(time(197001)-18))
           + 0.045881*log(RCOM)
           + 0.304*(dlog(WPG)-dlog(RXD)) + (1 - 0.304)*dlog(PPIY)
           + 0.063067*ifeq(197804) - 0.073622*ifeq(197903) + 0.13776 ;

*C AVI of imports of services               100*(IKBC/IKBF)          TA10,EA   AT0110
ratio(PMS) = ratio(PMNOX) ;
```

```
*C Inventories deflator                                    ----       HMT   NV0706
ratio(PINV) = ratio(PGDP) ;

*C Consumers' expenditure deflator       100*(ABJQ+HAYE)/(ABJR+HAYO)    TA2,EA   NV0409
ratio4(PCE) = ratio4(CPI) ;
*C Investment deflator (total GFCF)                NPQS/NPQT     T8,EA   NV0706
dlog(PIF) = - 0.12413*(log(PIF(-1)/ICOST(-1)) + 0.002064*time(197001))
          + 0.2231*dlog(PIF(-2)) + 0.2944*dlog(PIF(-4)) + 0.26781*dlog(ICOST)
          + (1 - 0.2231 - 0.2944 - 0.26781)*dlog(ICOST(-1))
          + 0.035523 - 0.00437*Q1 ;


*C Consumer durables deflator             100*(UTIB/UTID)    TA7,EA   NV0808
ratio(PCDUR) = ratio(PMNOX) ;
*C Interest Rate on Housing Finance                    ----      =HMT   NV0706
RHF = RMORT - (1 - 0.25*TPBRZ)*(RMORT - RDEP)*(1 - 0.001*LHP/GPW) ;
*C Owner occupancy rate                                T101     =DCLG   NV0808
OWC = OWC(-1) ;
*C Average House Price (Feb'02=100)                    ----     =ONS    NV0706
APH = APH(-1) ;
*C Housing: Depreciation RPI                           CHOO  T18.2,MD   NV0706
*M ratio(HD) = ratio(APH) ;

*C Market Sector GVA deflator                       ----    HMT     AT1108
PMSGVA = 100*(MSGVA£/MSGVA) ;

{======== Group 08: North Sea Oil ============================================}
*C GVA in North Sea oil & gas extraction            ABMM-KLS2     -----   NV0906
NSGVA = NSGVA(-1) ;
*C Total domestic demand for oil          ABMM-KLS2+BPIX-BOXX     -----   NV0106
*W PNNSGVA = (GDPM£(-1) - BPA£(-1) - (NSGVA(-1)*PBRENT(-1)/(OILBASE*RXD(-1))))
     / NNSGVA(-1) ; { Price index of non-oil GVA }
log(TDOIL) = log(TDOIL(-1)) - 0.22617*log(TDOIL(-1)/NNSGVA(-1))
           - 0.050667*log(PBRENT(-1)/(RXD(-1)*PNNSGVA))
           + 1.062500*log(NNSGVA(-1)/NNSGVA(-2))  - 0.001399*time(197001)
           + 0.081032*(ifge(198401)*ifle(198501)) - 0.59867
           - 0.234370*(ifeq(198601) - ifeq(198602)) ;
*C Exports of oil                                      BOXX     -----   NV0106
XOIL = 1.37*NSGVA ;
*C Imports of oil                                      BPIX     -----   NV0106
MOIL = TDOIL + XOIL - NSGVA ;
```

```
*C Price index for exports of oil            (ELBL/BOXX)*100     -----   RA0307
dlog(PXOIL) = log((100*PBRENT)/(OILBASE*RXD))
            - log((100*PBRENT(-1))/(OILBASE*RXD(-1))) ;
*C Price index for imports of oil            (ENXO/BPIX)*100     -----   RA0307
dlog(PMOIL) = dlog(PXOIL) ;
*C North Sea Gross Trading Profits:PNFCs                  CAGD     T3,SR   NV1005
*M ratio(NSGTP) = ratio(NSGVA)*ratio(PBRENT)/ratio(RXD) ;
*C Brent crude oil price ($ per barrel)                  =IMF     -----   NV0708
PBRENT = PBRENT(-1) ;

{======== Group 09: Public Expenditure ========================================}

*C CG compensation of employees                          QWPS     -----   AT0310
CGWS = CGWADJ*ERCG*ECG*(52/4000)*(1 + (1.249*EMPSC/WFP) ) ;

*C LA compensation of employees                          QWRY     -----   AT0310
LAWS = LAWADJ*ERLA*ELA*(52/4000)*(1 + (1.418*EMPSC/WFP) ) ;

*C CG procurement expenditure                            QWPT     -----   NV1205
CGP = CGP(-1) ;
*C LA procurement expenditure                      QWRZ-NMKK     -----   NV1205
LAPR = LAPR(-1) ;
*C CG gross fixed capital formation                      NMES   TA31,EA   NV0506
CGI£ = CGI£(-1) ;
*C LA gross fixed capital formation                      NMOA   TA36,EA   NV0608
LAI£ = LAI£(-1) ;
*C CG non-trading capital consumption                    NSRN  PSAT2,PF   PM0907
RCGIM = RCGIM(-1) ;
*C LA non-trading capital consumption                    NSRO  PSAT2,PF   PM0907
RLAIM = RLAIM(-1) ;
*C General Govt Gross Operating Surplus                  NMXV  PSAT2,PF   AT0210
OSGG = RCGIM + RLAIM + 100;
*C General Govt final consumption                        NMRP    TA2,EA   NV1205
CGG£PSF = (CGWS + LAWS) + (CGP + LAPR) + (RCGIM + RLAIM) ;
CGG£ =    (CGWS + LAWS) + (CGP + LAPR) + (RCGIM + RLAIM) ;
*C General Govt final consumption deflator      100*NMRP/NMRY    TA2,EA   RI1107
GGFCD = GGFCD(-1) ;
*C General Govt final consumption CVM                    NMRY    TA2,EA   NV1205
CGG = CGG£/(GGFCD/100) ;
*C CG subsidies on products                              NMCB   TA27,EA   NV0506
CGSUBP  = CGSUBP(-1) ;
```

```
*C Payable company tax credits                              MDXH     -----   NV0506
PCOTC  = PCOTC(-1) ;
*C Reduced liability company tax credits            JPPT-MDXH     -----   NV0506
RLCOTC = RLCOTC(-1) ;
*C CG subsidies on production                               NMCC   TA27,EA   NV0506
CGSUBPR = CGSUBPR(-1) ;
*C CG total subsidies: products & production                NMCD  PSAT2,PF   NV0506
CGTSUB  = CGSUBP + CGSUBPR ;
*C LA subsidies on production                               LIUC   TA32,EA   NV0506
LASUBPR = (LASUBPR(-4) + LASUBPR(-3) + LASUBPR(-2) + LASUBPR(-1))*0.25
       *(PGDP*4)/(PGDP(-4) + PGDP(-3) + PGDP(-2) + PGDP(-1))  ;
*C LA subsidies on products                         ADAK-LIUC T5.3.3,BB   NV0506
LASUBP = LASUBP(-1) ;
*C LA total subsidies: products & production                ADAK  PSAT2,PF   NV0506
LATSUB = LASUBP + LASUBPR ;
*C LA net social benefits to HH                             GZSK  PSAT2,PF   NV0506
LASBHH = LASBHH(-1) ;
*C Total grants from CG to LA                               QYJR  PSAT2,PF   NV0506
CGCGLA = CGCGLA(-1) ;
*C CG net social benefits to households                     GZSJ  PSAT2,PF   NV0506
CGSB = CGSB(-1) ;
*C Debt Interest Payments on Natl Savings                   XACX     -----   NV0506
DIPNSC = DIPNSC(-1) ;
*C Interest payments on gilts redeemed & other flows        ----       HMT   NV0506
REDOTH = REDOTH(-1) ;
*C Debt interest payments on conventional gilts             CUEM     -----   NV1105
GILTRATE = GILTRATE(-1) ;
DIPLDC = DIPLDC(-1) ;
*C Debt interest payments on index-linked gilts             CMSU     -----   NV1105
IILG = IILG(-1) ;
*C Accrued uplift on index-linked gilts                     NMRB     -----   NV0506
ILGUP = ILGUP(-1) ;
*C Accruals adjustment on index-linked gilts               -NMQZ     -----   NV0506
ILGAC = ILGAC(-1) ;
*C CG interest/dividends paid to private sector & RoW       NMFX  PSAT2,PF   NV1007
DICGOP = DICGOP(-1) ;
*C LA interest/dividends paid to private sector & RoW       NUGW  PSAT2,PF   RA0907
DILAPR = DILAPR(-1) ;
*C CG NET interest & dividends from Public Sector           ANNY  PSAT2,PF   NV0507
```

```
CGINTRA = CGINTRA(-1) ;
*C LA NET interest & dividends from Public Sector        ANPZ  PSAT2,PF   NV0507
LAINTRA = LAINTRA(-1) ;
*C PC NET interest & dividends from Public Sector        ANRW  PSAT2,PF   NV0507
PCINTRA = PCINTRA(-1) ;
*C GG actual social contributions                        GCMP 6.1.4S,BB   NV0608
ratio(CGASC) = ratio(CGWS) ;
*C CG imputed social contributions                QYJS+RUDY 5.2.4S,BB   NV0506
ratio(CGISC) = ratio(CGWS) ;
*C CG employee social contributions               CX3X+FJBH 5.2.4S,BB   NV0307
ratio(EESCCG) = ratio(CGWS) ;
*C LA imputed social contributions                        GCMN 5.3.4S,BB   NV0506
ratio(LASC) = ratio(LAWS) ;
*C LA employee social contributions                       NMWM 5.3.4S,BB   NV0506
ratio(EESCLA) = ratio(LAWS) ;
*C WFTC scoring as Negative Tax                  -MDYL+LIBJ     -----   NV0506
WFTCNT = WFTCNT(-1) ;
*C CG net current grants abroad                           GZSI  PSAT2,PF   NV0506
CGNCGA = ECNET + TROD ;
*C LA net current grants abroad                           C626  PSAT2,PF   NV0307
LANCGA = LANCGA(-1) ;
*C CG other current grants                                NMFC  PSAT2,PF   NV0506
CGOTR = CGOTR(-1) ;
*C LA other current grants (to HH)                        EBFE  PSAT2,PF   NV0506
LAOTRHH = LAOTRHH(-1) ;
*C CG miscellaneous payments                      ANRS-ABIF  PSAT2,PF   NV0506
CGMISP  = CGMISP(-1) ;
*C LA miscellaneous expenditure                           LSIB  PSAT2,PF   NV0506
LAMISE = LAMISE(-1) ;
*C LA payments of NNDR                                    CQOQ     -----   NV0506
LANNDR  = LANNDR(-1) ;

{======== Group 10: Public Sector Receipts ===================================}

*C Basic rate of income tax                               ----       HMRC   NV0606
TPBRZ = TPBRZ(-1) ;
*C Taxes on income from employment                        DBBO     -----   DS0813
TYEM = TYEM(-1) ;
*C Income tax accruals adjustment         CYNX+RUTC+DKHE+DBKE     -----   DS0813
INCTAC = INCTAC(-1) ;
```

```
*C Company IT withheld accruals adjustment          DKHH+ZYBE     -----   DS0813
FCACA = FCACA(-1) ;
*C Taxes on self-employment incomes                      ZAFG     -----   DS0813
TSEOP = TSEOP(-1) ;
*C Employees' (& self-employed) payments of NICs    AIIH-CEAN   PSF3,PF   DS0813
EENIC  = EENIC(-1) ;
*C Employers' payments of NICs                          CEAN T6.1.4S,BB   DS0813
EMPNIC = EMPNIC(-1) ;
*C National Insurance accruals adjustment     ACJY(AIIH-ABLP)     -----   DS0813
NICAC = NICAC(-1) ;
*C Inheritance tax                                 ACCH+LSON    TA31,EA   NV0606
INHT = INHT(-1) ;
*C Swiss Capital Tax                                     KW69             TP0813
SWISSCAP = SWISSCAP(-1) ;
*C Capital Gains tax (paid by HH)                        QYJX      D512   NV0607
CGT = CGT(-1) ;
*C Stamp duty receipts                                   ACCI  T2.1C,FS   DS0813
TSD = TSD(-1) ;
*C Petroleum Revenue Tax                                 ACCJ  T2.1C,FS   DS0813
PRT = PRT(-1) ;
*C North Sea Corporation Tax Payments                    DBJY     -----   DS0813
NSCTP = NSCTP(-1) ;
*C Corporation tax rate                                  ----       HMT   NV0908
TCPRO = TCPRO(-1) ;
*C Onshore corporation tax               ACCD+JPPT-MDXH-DBJY  T2.1C,FS   DS0813
NNSCTP = NNSCTP(-1) ;
*C Corporation tax (gross of tax credits)      ACCD-MDXH+JPPT  T2.1C,FS   NV0606
CT = NSCTP + NNSCTP ;
*C Other company taxes on investment                     GRXE     -----   DS0813
TCINV = TCINV(-1) ;
*C Tax on Local Authority Equal Pay Settlements          C625     -----   DS0813
LAEPS = LAEPS(-1) ;

*C Public Corp. onshore coporation tax payments      FCCS+JW27        ONS NV0306
TYPCO = TYPCO(-1) ;
*C Bank payroll tax                                  JT2Q         ONS AT0110
BANKROLL = BANKROLL(-1) ;
*C Bank Levy                                         KIH3         ONS AT0610
BLEVY = BLEVY(-1) ;
```

```
*C Higher rate of VAT                                    ----       HMT   NV0207
TVAT = TVAT(-1) ;
*C Net VAT receipts                                      EYOO  T2.1D,FS   DS0813
VREC = VREC(-1) ;

*C Hydrocarbon oils duty receipts                        ACDD  T2.1D,FS   DS0813
TXFUEL = TXFUEL(-1) ;
*C Tobacco duty                                          ACDE  T2.1D,FS   NV0606
TXTOB = TXTOB(-1) ;
*C Alcohol duties: beer, wines & spirits          ACDF/G/H/I  T2.1D,FS   NV0606
TXALC = TXALC(-1) ;
*C Climate Change Levy                                   LSNS  T2.1D,FS   NV0707
CCL = CCL(-1) ;
*C Aggregates Levy                                       MDUP  T2.1D,FS   NV0707
AL = AL(-1) ;
*C Misc. C&E taxes                      ACDJ+ACDP+ACDO+DOLC  T2.1D,FS   DS0813
TXCUS = TXCUS(-1) ;
*C Customs & Excise taxes                                ACAC  T2.1D,FS   NV0707
CETAX = VREC + TXFUEL + TXTOB + TXALC + EUOT + CCL + AL + TXCUS ;
*C HMRC indirect taxes accruals adjustments              RUSD     -----   NV0606
EXDUTAC = EXDUTAC(-1) ;
*C Rail Franchise Payments                               LITT     -----   DS0813
RFP = RFP(-1) ;
*C Misc. taxes on products                               LIYH  T11.1,BB   DS0813
TXMIS = TXMIS(-1) ;
*C Renewable Obligation Certificates (tax on products)   EP89  T11.1,BB   DS0813
ROCS = ROCS(-1) ;
*C Vehicle Excise Duty                                   GTAX     -----   NV0307
VED = VEDHH + VEDCO ;
*C VED paid by other sectors; production tax        GTAX-CDDZ     -----   NV0307
VEDCO = VEDCO(-1) ;
*C VED paid by HH; currrent taxes                        CDDZ  T11.1,BB   NV0307
VEDHH = VEDHH(-1) ;
*C BBC license fees                                      DH7A     -----   NV0706
BBC = BBC(-1) ;
*C Passport fees                                         E8A6     -----   NV0706
PASSPORT = PASSPORT(-1) ;
*C Other household taxes                 NSFA+CQTC+NRQB+IY9O     -----   DS0813
OHT = OHT(-1) ;
```

```
*C Other current taxes: rec'd by CG                NMCV-CQOQ     -----   NV0706
OCT = VEDHH + BBC + PASSPORT + OHT ;
*C Betting tax scored as taxes on income & wealth       MIYF  see doc.   NV0606
BETPRF = BETPRF(-1) ;
*C Betting levies scored as taxes on income & wealth    DW9E  see doc.   NV0107
BETLEVY = BETLEVY(-1) ;
*C OFGEM renewable energy tax                           EO2E     -----   DS0813
OFGEM = OFGEM(-1) ;
*C EU Emission Trading Scheme receipts                           -----   DS0813
EUETS = EUETS(-1) ;
*C Road Lorry User Charge                                 ONS     TP0813
RULC = RULC(-1) ;
*C Other taxes on production                  See model doc T11.1,BB   DS0813
OPT = OPT(-1) ;
*C LA receipts of production taxes                      NMYH   TA32,EA   DS0813
LAPT = LAPT(-1) ;
*C Community Infrastructure Levy                 ----       OBR   AT1209
CIL = CIL(-1) ;

*C Recipts from carbon reduction commitment, feed in tariffs ----   OBR   AT1209
ENVLEVY = ENVLEVY(-1) ;
*C CG interest receipts: earnings on reserves           D69U     -----   SK0107
*W RBOND =  0.72*ROSHT + (1-0.72)*ROLT ;
CGC = ((1+(ROSHT - 0.3)/100)^0.25 - 1)*SRES(-1) + 118 ;
*C CG interest & dividends from Private sector & RoW    GVHE  PSAT2,PF   NV0507
CGNDIV  = CGNDIV(-1) ;
*C LA interest & dividends from Private sector & RoW    GVHF  PSAT2,PF   NV1106
LANDIV  = LANDIV(-1) ;
*C PC interest & dividends from PS % ROW           GVHG-JW29  PSAT2,PF   NV1106
PCNDIV  = PCNDIV(-1) ;
*C Public Sector interest & dividend receipts      JW2L+JW2M  PSAT2,PF   NV1106
PSINTR = CGNDIV + LANDIV + PCNDIV ;

*C Household transfers to CG                            NMEZ   TA28,EA   NV0606
HHTCG = HHTCG(-1) ;
*C CG rent receipts                                     NMCK   TA27,EA   NV0606
RNCG = RNCG(-1) ;
*C CG rent & other current transfers                    ANBU  PSAT2,PF   NV0506
CGRENT = RNCG + HHTCG ;
*C LA rent & other current transfers                    ANBX  PSAT2,PF   NV0506
```

```
LARENT = LARENT(-1) ;
*C PC rent & other current transfers                    ANCW  PSAT2,PF   NV0506
PCRENT = PCRENT(-1) ;
*C VAT refunds to LAs                                   CUCZ     -----   DS0813
LAVAT = LAVAT(-1) ;
*C VAT refunds (except to LAs)                          CUNW     -----   DS0813
XLAVAT = XLAVAT(-1) ;
*C Council tax accruals                                    NMIS   TA33,EA   DS0813
CC = CC(-1) ;
*C National Non-Domestic Rates Accrued receipts         CUKY     -----   NV0606
NNDRA = NNDRA(-1) ;
*C MIRAS, LAPRAS & PMI scored as receipts               GCJG     -----   DS0813
MILAPM  = MILAPM(-1) ;
*C MIRAS, LAPRAS & PMI scored as expenditure   DCHG+DCHF+GCJJ     -----   DS0813
MILAPME = MILAPME(-1) ;

*C VTR & other reliefs scored as expenditure   IQKI+BKSG+BKSH     -----   NV0606
VTRCS = VTRCS(-1) ;
*C Child tax credit                                    -MDYL     -----   NV0606
CTC = CTC(-1) ;
*C Total income tax credits scored as negative tax   GCJG+MDYL      ONS   NV0606
TAXCRED = MILAPM + CTC ;

*C NPISH tax credits                                    -CFGW    -----   NV0306
NPISHTC = NPISHTC(-1) ;
*C Working & children's tax credits                     MDYN     -----   NV0306
WTCCTC = WTCCTC(-1) ;

*C Allowance for tax litigation losses                     ----       HMT AT1209
PROV = PROV(-1) ;


*C Income tax gross of tax credits                      LIPG     -----   NV0306
INCTAXG  = TYEM + TSEOP + TCINV - INCTAC + CTC - NPISHTC ;

*C Public Sector taxes on Income & Wealth               ANSO  PSAT2,PF   NV0306
PUBSTIW = TYEM + TSEOP + PRT + TCINV + CT + CGT + FCACA
        + BETPRF + BETLEVY + OFGEM - NPISHTC - TYPCO + PROV - LAEPS ;
*C Public Sector taxes on Production (& products)       NMYE  PSAT2,PF   NV1108
PUBSTPD = (CETAX - BETPRF) + EXDUTAC + XLAVAT + LAVAT - EUVAT - EUOT
         + TSD + ROCS + TXMIS + RFP
        + (NNDRA + VEDCO + LAPT + OPT + EUETS)
```

```
       + CIL + ENVLEVY + BANKROLL + RULC;
*C Public Sector Current Receipts                          JW2O  PSAT2,PF   NV0206
PSCR = PUBSTIW + PUBSTPD + OCT + CC + INHT + EENIC + EMPNIC
     + (RCGIM + RLAIM + OSPC) + PSINTR + (RNCG + HHTCG)
     + LARENT + PCRENT + BLEVY + LAEPS + SWISSCAP;

*C National Accounts taxes                                 GCSU      ONS    TP0813
NATAXES  = PUBSTIW + PUBSTPD + OCT + BLEVY + INHT + LAEPS
     + SWISSCAP + EENIC + EMPNIC + CC + EUOT + EUVAT ;

{======== Group 11: Balance of Payments ======================================}
*C ERI-weighted 3 month interest rate: EU+US+Japan+Canada           HMT   NV0207
ROSHT = ROSHT(-1) ;
*C Sterling effective exchange rate               BK67(AGBG)  T7.1A,FS   NV0206
log(RX) = log(RX(-1))+log((1+ROSHT(-1)/400)/(1+RS(-1)/400))    ;
*C Sterling-dollar cross rate: $/£                          AUSS  T7.1A,FS   NV0206
*M  RXD   = RXD(-1)*ratio(RX) ;
*C Sterling-euro exchange rate: Euro/£                      THAP  T7.1A,FS   NV0206
*M  ECUPO =    (ECUPO(-1)*ratio(RX)) ;
*C GDP-weighted 10y rate: EU+US+Japan+Canada                       HMT   NV0207
ROLT = ROLT(-1) ;
*C World equity prices, GDP weighted                               HMT   NV0906
WEQPR = WEQPR(-1) ;
*C Changes in reserve assets                     AIPA(LTCV)  T1.2A,FS   NV0407
diff(DRES) = 0 ;
*C Stock of reserve assets                          LTEB  T1.1D,FS   NV0407
SRES = -DRES + ( 1 + 0.227*(RXD(-1)/RXD - 1) + 0.364*(RX(-1)/RX - 1))*SRES(-1) ;

*C BoP investment income credits (ex reserve assets) HBOK-HHCC  T4.1,PB   AT1010
*P ADJRDL = 0 ;
*P ADJREQL = 0 ;
*P ADJRBL = 0 ;
*P ADJROL = 0 ;
*W REXC = (DLROW(-1)/LROW(-1))*(2.47 + 0.0186*100*d4log(WEQPR) + ADJRDL)
+ (EQLROW(-1)/LROW(-1))*(0.379 + 0.00411*time(198701) + ADJREQL)
+ (BLROW(-1)/LROW(-1))*(ROLT/4 - 0.17 + ADJRBL)
+ (OTLROW(-1)/LROW(-1))*(0.12*RS/4 + (1 - 0.12)*ROSHT/4 - 0.05 + ADJROL) ;

CIPD = ( 0.7173*CIPD(-1)/LROW(-2) + (1 - 0.7173)*REXC/100 )*LROW(-1) ;

*C BoP investment income debits                  HBOL  T4.1,PB   AT1010
*P ADJRDA = 0 ;
*P ADJREQA = 0 ;
*P ADJRBA = 0 ;
```

```
*P ADJROA = 0 ;

*W REXD = (DAROW(-1)/AROW(-1))*(-2.6703 + 0.2786*100*FYCPR/GDPM£ +
0.0142*100*d4log(EQPR) + ADJRDA)

+ (EQAROW(-1)/AROW(-1))*(0.7162 - 0.009276*time(198701) + 0.6175*100*NDIVHH/EQHH +
ADJREQA)

+ (BAROW(-1)/AROW(-1))*(RL/4 - 0.19 + ADJRBA)

+ (OTAROW(-1)/AROW(-1))*(0.15*RS/4 + (1 - 0.15)*ROSHT/4 + 0.04 + ADJROA) ;


DIPD = ( 0.6283*DIPD(-1)/AROW(-2) + (1 - 0.6283)*REXD/100 )*AROW(-1) ;

*C CG IPD credits: earnings on reserves (BoP)            HHCC     TG,BP   NV1005

diff(CGCBOP) = diff(CGC) ;

*C Investment income balance                             HBOM     TG,PB   NV1005

NIPD = CIPD - DIPD + CGCBOP ;

*C Employees compensation due abroad                     IJAI   T4.1,PB   NV1005

ratio(EECOMPD) = ratio(FYEMP) ;

*C Employees compensation from abroad                    IJAH   T4.1,PB   NV1005

ratio(EECOMPC) = ratio(MAJGDP) ;

*C EU subsidies on products              FKNG(ZXIA-ZJZD+FHHS)  TA42,EA   NV1007

EUSUBP  = 0 ;

*C EU subsidies on production                      FHLK(ZJZD)  TA42,EA   NV1007

EUSUBPR = EUSUBPR(-1)*ECUPO(-1)/ECUPO ;

*C Receipts from EU social fund                          H5U3     TH,BP   NV0106

EUSF = EUSF(-1)*ECUPO(-1)/ECUPO ;

*C Net EC contributions (BoP basis)               -FKKL-FKIJ   T5.1,PB   NV0106
*C Net EC contributions (PSF basis)            -FKKM-GTTA

ECNET = (1 - 0.5*(ECUPO(-1)/ECUPO - 1))*ECNET(-1) ;

*C UK 4th resource contribution to EU               HCSO+HCSM   T5.1,PB   NV0106

GNP4 = 0.010*((GDPM£ + NIPD + EECOMPC - EECOMPD)/ECUPO(-4)) ;

*C UK VAT payments to the EU                        HCML+FSVL   T5.1,PB   NV0506

EUVAT = 0.0325*VREC/(0.8267*ECUPO(-4)) ;

*C Payments of taxes on products to EU              FJWE+FJWG   T5.1,PB   NV0606

ratio(EUOT) = ratio(GDPM£) ;

*C Social security benefits paid abroad                  FLUK   T5.1,PB   NV0106

BENAB = 0.012*CGSB ;

*C CG non-EC transfer debits             FJUO-FJCK-HCSO-HCSM   T5.1,PB   NV0207

TROD = TROD(-1) ;

*C Tax receipts from abroad                              CGDN   T5.1,PB   NV1005

CGITFA = ITA ;

*C Tax payments abroad                                   FLVE   T5.1,PB   NV1005

ITA = 0.001115*WFP + 0*CIPD ;

*C HH transfer receipts from abroad           CGDO-FKNN-FLYE   T5.1,PB   NV1005
```

```
log(HHTFA) = log(HHTFA(-1)*MAJGDP/MAJGDP(-1)) ;
*C HH transfer payments abroad            CGDS-FLVY-FHLS-FLVE   T5.1,PB   NV1005
ratio(HHTA) = ratio(WFP) ;
*C Non-life insurance claims & premiums             FKNN+FLVY   T5.1,PB   NV1005
INSURE = INSURE(-1) ;
*C Transfer credits                                       IKBN     TH,BP   NV1005
TRANC = EUSUBP + HHTFA + EUSF + CGITFA + EUSUBPR - ECNET + INSURE ;
*C Transfer debits                                        IKBO     TH,BP   NV1005
TRAND = TROD + EUVAT + EUOT + HHTA + GNP4 + BENAB + ITA + INSURE ;
*C Transfers balance                                      IKBP     TH,BP   NV1005
TRANB = TRANC - TRAND ;
*C Central Govt capital transfers abroad                  FLWB     TI,BP   NV0106
CGKTA = 0.02351*KCGPSO ;
*C Capital transfer payments from EU                      GTTY     TI,BP   NV0106
EUKT = EUKT(-1) ;
*C Migrants capital transfers from abroad                 FHJC     TI,BP   NV0106
log(MIKTFA) = log(MIKTFA(-1)) ;
*C Migrants capital transfers to abroad                   FLWJ     TI,BP   NV0106
log(MIKTA)  = log(MIKTA(-1)) ;
*C Other private sector capital transfers abroad    FLWI-FLWJ     TI,BP   NV0106
OPSKTA = OPSKTA(-1) ;
*C Net acquisition of non-produced non-fin. assets  FHJL-FLWT     TI,BP   NV0106
NPAA = NPAA(-1) ;
*C Balance of trade in goods & services         IKBJ     T1,TD       AT0110
TB = X£ - M£ ;
*C Current balance                                        HBOP     TB,BP   NV1005
CB  = TB + (EECOMPC - EECOMPD) + NIPD + TRANC - TRAND ;
*C Current balance % GDP                                  AA6H   T1.1,PB   NV1005
CB% = (CB/GDPM£)*100 ;
*C Net lending by Rest of the World (SA from capital a/c) RQCH   TA12,EA   NV0308
NAFROW = - (CB + (EUKT + MIKTFA) - (CGKTA + MIKTA + OPSKTA) + NPAA) ;
{======== Group 12: Public Sector totals ====================================}
*C Gross Operating Surplus of Public Corporations         NRJT  PSAT2,PF   NV0306
OSPC = OSPC(-1) ;
*C PC interest payments to private sector & RoW           GZSO  PSAT2,PF   NV0306
DIPCOP = DIPCOP(-1) ;
*C Public Corp. capital consumption                       NSRM  PSAT2,PF   PM0907
PCCON = PCCON(-1) ;
*C Public Corp's change in inventories & valuables        DHHL  PSAT2,PF   NV0306
```

```
IBPC = IBPC(-1) ;
*C Public Corp. onshore coporation tax payments          FCCS  PSAT2,PF   NV0306
TYPCO = TYPCO(-1) ;
*C PC net lending to private sector & RoW                ANRY  PSAT2,PF   NV0306
PCLEND = PCLEND(-1) ;
*C PC misc. expenditure                                  ANRZ  PSAT2,PF   NV0306
PCMISE = PCMISE(-1) ;
*C Public Corp. accounts rec./paid                ANVQ + JXJ4  PSAT2,PF   NV0306
PCAC = PCAC(-1) ;
*C Public Corp. adjustment for gilt interest             NCXS  PSAT2,PF   NV0306
PCGILT = PCGILT(-1) ;
*C Local authority adjustment for gilt interest          NCBV  PSAT2,PF   TP0913
LAGILT = LAGILT(-1) ;
*C Public Corp. other financial transactions             ANVU  PSAT2,PF   NV0306
MFTPC = MFTPC(-1) ;
*C Public Sector Current Expenditure                     JW2Q  PSAT2,PF   NV0307
PSCE = (CGWS + CGP + RCGIM + LAWS + LAPR + RLAIM) + (CGTSUB + LATSUB)
     + (CGSB + LASBHH) + CGNCGA + LANCGA + (CGOTR + LAOTRHH)
     + (DICGOP + DILAPR + DIPCOP) ;
*C Public Sector Depreciation                            JW2S  PSAT2,PF   NV0306
DEP  = RCGIM + RLAIM + PCCON ;
*C Public Sector Current Budget                          JW2T  PSAT2,PF   NV0109
PSCB = PSCR - PSCE - DEP ;
*C PC capital grants from private sector                 ADSE  PSAT2,PF   NV0306
KPSPC = KPSPC(-1) ;
*C Net PC capital grants to private sector           MIYZ  PSAT2,PF   NV0306
KPCPS = KPCPS(-1) ;
*C PC capital grants from Central Government  -ANND-NMGR-NMGT     -----   NV0306
KCGPC = KCGPC(-1) ;
*C PC capital grants from Local Authorities              ADCF     -----   NV0306
KGLAPC = KGLAPC(-1) ;
*C Capital grants by CG to private sector & ROW          ANNI  PSAT2,PF   NV1005
KCGPSO = KCGPSO(-1) ;
*C Capital grants by private sector (&RoW) to CG         ANNN  PSAT2,PF   NV1005
KPSCG  = KPSCG(-1) ;
*C Capital grants by private sector (&RoW) to LA         ANNO  PSAT2,PF   NV0606
KGLA = KGLA(-1) ;
*C Total capital transfers by LA                         NMNL   TA36,EA   NV1005
KLA = KLA(-1) ;
```

```
*C Capital grants by CG to LA                          NMGR+NMGT     -----   NV0506
KCGLA = KCGLA(-1) ;
*C CG net acquisitions Non-Produced Non-Fin. Assets      NMFG   TA31,EA   NV0506
NPACG = (NPACG(-1)+NPACG(-2)+NPACG(-3)+NPACG(-4))/4 ;
*C LA net acquisitions Non-Produced Non-Fin. Assets      NMOD   TA31,EA   NV0506
NPALA = (NPALA(-1)+NPALA(-2)+NPALA(-3)+NPALA(-4))/4 ;
*C Public Sector Gross Investment                                HMT   NV0306
PSGI = CGI£ + LAI£ + IPC£ + IBPC + DINVCG + (NPACG + NPALA)
     + (KCGPSO - KPSCG) + (KLA - KGLAPC - KGLA) + (KPCPS - KPSPC)
     + ASSETSA ;
*C Public Sector fixed asset sales                               HMT   NV0306
ASSETSA = ASSETSA(-1) ;
*C Public Sector Net Investment                          JW2Z  PSAT2,PF   NV0109
PSNI = PSGI - DEP - ASSETSA ;
*C Total Managed Expenditure                             KX5Q  PSAT2,PF   NV0506
TME = PSCE + DEP + PSNI ;
*C Central Government Net Borrowing                     -NMFJ  PSAT2,PF   NV0507
CGNB  = (CGWS + CGP) + CGTSUB + CGSB + CGNCGA + CGCGLA + CGOTR + DICGOP
      + (CGI£ + NPACG) + DINVCG + (KCGLA + KCGPC) + KCGPSO - KPSCG
      - (PUBSTIW + TYPCO) - (PUBSTPD - LAPT) - (OCT + LANNDR) - (INHT + LAEPS
      + SWISSCAP) - (EMPNIC + EENIC) - CGNDIV - CGINTRA  - (RNCG + HHTCG + BLEVY) ;
*C Local Authority Net Borrowing                        -NMOE  PSAT2,PF   NV0307
LANB  = (LAWS + LAPR) + LATSUB + LASBHH + LANCGA - CGCGLA + LAOTRHH + DILAPR
      + (LAI£ + NPALA) - KCGLA + (KLA - KGLAPC) - KGLA
      - LAPT - (CC - LANNDR) - LAINTRA - LANDIV - LARENT - CIL;
*C General Govt Net Borrowing (NSA)                     -NNBK  PSAT2,PF   NV0206
GGNB   = CGNB + LANB ;
*C General Govt Net Borrowing (CYSA)                    -RPZD T14.5E,FS   NV0308
GGNBCY = GGNB ;
*C Public Corporations Net Borrowing (NSA)              -CPCM  PSAT2,PF   NV0206
PCNB = DIPCOP + IPC£ + IBPC - (KCGPC + KGLAPC) + (KPCPS - KPSPC)
     + TYPCO - OSPC - PCNDIV - PCINTRA - PCRENT ;
*C Public Corporations Net Borrowing (CYSA)             -RQBN T14.2C,FS   NV0308
PCNBCY = PCNB ;
*C Public Sector Net Borrowing (NSA)                    -J5II  PSAT2,PF   NV0506
PSNBNSA = - PSCB + PSNI ;
*C Public Sector Net Borrowing (CYSA)             -RQBN-RPZD T14.5E,FS   NV0506
PSNBCY  = PSNBNSA ;
*C Swap adjustments                                       CFZG     -----   NV0206
```

```
SWAPS = 0 ;
*C CG net borrowing: Maastricht definition              MDUK       HMT   NV0906
TDEF = CGNB + LANB + SWAPS ;
*C CG loans & sales of financial assets            ANRH+ANRS  PSAT2,PF   NV0306
CGLSFA = (LCGOS + LCGPR) + (CGMISP) ;
*C Public Sector loans & sales of financial assets  JW33+JW34  PSAT2,PF   NV0306
PSLSFA  = CGLSFA + (LALEND + LAMISE) + (PCLEND + PCMISE) ;
*C LA accounts receivable/payable                       ANML  PSAT2,PF   NV0606
LAAC = LAAC(-1) ;
*C LA misc. financial transactions                      ANMW  PSAT2,PF   NV0506
LAMFT = LAMFT(-1) ;
*C Accruals adjustment on conventional gilts       -GCSW-GCMR     -----   NV0506
CONACC = CONACC(-1) ;
*C CG misc. financial transactions                     ANRV  PSAT2,PF   NV0506
MFTRAN = MFTRAN(-1) ;
*C CG accruals adjustment residual                       OBR     -----   TP0913
CGACRES = CGACRES(-1) ;
*C Central Govt accruals adjustments          ANRT+ANRU+ANRV  PSAT2,PF   NV0306
CGACADJ = (EXDUTAC + NICAC + INCTAC) + FCACA + CGACRES
        + (ILGAC + CONACC) + MFTRAN ;
*C Public Sector accruals adjustments         JW35+JW36+JW37  PSAT2,PF   NV0306
PSACADJ = CGACADJ + LAAC + LAMFT + PCAC + PCGILT + MFTPC ;
*C Public Sector Financial Assets                 NKFB+NPUP T12.1K,FS   NV1005
PSFA  = PSFA(-1)  ;
*C Other Public Sector Financial Liabilities      NKIF+NPVQ-NIJI-ACUA   NV1005
OFLPS = OFLPS(-1) ;
*C Stock of Index-linked gilts (market value)                HMT   NV1105
MKTIG = MKTIG(-1) ;
*C Stock of CG gilts excluding linkers           NIJI-MKTIG T12.1L,FS   NV0507
CGGILTS = CGGILTS(-1) ;
*C Public Sector Financial Liabilities            NKIF+NPVQ T12.1K,FS   NV1005
PSFL = CGGILTS + OFLPS + NATSAV + MKTIG ;
*C Public Sector Tangible Assets (end period)           NG4K T10.11,BB   NV1005
PSTA = PSTA(-1)*ratio(PIF)
     + 0.5*(PSNI + KCGPC + KGLAPC - KLA - KCGPSO)*(1 + ratio(GGIDEF)) ;
*C Public Sector Net Worth (end period)                 CGTY T10.11,BB   NV1005
PSNW = PSTA + PSFA - PSFL ;
*C CG net lending to RoW                                HEUC  PSAT2,PF   NV0506
LCGOS  = LCGOS(-1) ;
```

```
*C CG net lending to private sector                ANRH-HEUC  PSAT2,PF   NV0506
LCGPR  = LCGPR(-1) ;
*C Net lending by CG to PCs                             ABEI  T1.4A,FS   NV0506
LCGPC = LCGPC(-1) ;
*C Net lending by CG to LAs                             ABEC  T1.3A,FS   NV0506
LCGLA = LCGLA(-1) ;
*C LA net lending to private sector & RoW                ADDU  PSAT2,PF   NV0506
LALEND = LALEND(-1) ;
*C LA market borrowing net CG/PC debt                   AAZK  T1.1E,FS   NV0506
LABRO = LANB + LALEND + LAMISE + LAAC + LAGILT + LAMFT - LCGLA ;
*C CG Net Cash Requirement                              RUUW  T1.2A,FS   NV0506
CGNCR = CGNB + CGLSFA + CGACADJ + LCGLA + LCGPC ;
*C Public Sector Net Cash Requirement                   JW38  T1.2A,FS   NV0506
PSNCR = PSNBNSA + PSLSFA + PSACADJ ;
*C Stock of coins                                       NIIK T12.1L,FS   NV0506
ratio4(COIN) = ratio4(M0) ;
*C Stock of National Savings                            ACUA  T1.1D,FS   NV1105
NATSAV = NATSAV(-1);
*C CG liquid assets                                BKSM+BKSN  T1.1D,FS   NV0506
CGLIQ = CGLIQ(-1) ;
*C Imputed GG debt from finance leases             F8YF+F8YH      -----   SK1006
FLEASGG = FLEASGG(-1) ;
*C Imputed PC debt from finance leases                   F8YJ     -----   SK1006
FLEASPC = FLEASPC(-1) ;
*C Public Sector Net Debt                               HF6W  T1.1D,FS   NV1006
diff(PSND) = PSNCR - ILGAC + diff(FLEASGG) + diff(FLEASPC) + PSNDRES ;
*C LA liquid assets                                BKSO+BKQG  T1.1D,FS   NV0506
LALIQ = LALIQ(-1) ;
*C General Government Liquid Assets       BKQJ-BKSQ-BKSP-LTEB  T1.1D,FS   NV0506
GGLIQ = CGLIQ + LALIQ ;
*C General Government Gross Debt                        BKPX  T1.1D,FS   NV1006
diff(GGGD) = CGNCR + LABRO - ILGAC + diff(SRES) + diff(GGLIQ) + GGGDRES ;
*C Other changes in PSND                                 OBR     -----   TP0913
PSNDRES = PSNDRES(-1) ;
*C Other changes in GGGD                                 OBR     -----   TP0913
GGGDRES = GGGDRES(-1) ;

{======== Group 14: Domestic financial sector ================================}
*C Bank rate                                             BoE             NV0907
R  = R(-1) ;
```

```
*C Short rates: 3 month inter-bank rate                    BOE            NV0907
RS = RS(-1) ;
*C Long rates: 20 year gilt yield                          BoE  IUQALNPY  NV0206
RL = RL(-1) ;
*C Average effective Bank mortgage rate               -------      =BoE   AD1009
RMORT = RMORT(-1) ;
*C Bank deposit rate: sight & time deposits              ----      =BoE   AT0909
RDEP = RDEP(-1) ;
*c Effective Rate on Bank lending to PNFCs         CFMHSDC     =BoE   AT0909
diff(RIC) = 0.95301*diff(RS) - 0.24897*(RIC(-1) - RS(-1) - 1.923) ;

*C Equity price index: FT all-share                       HSEL     -----   NV0206
dlog(EQPR) = dlog(GDPM£) ;
*C Notes & coins in circulation outside BoE               AVAB  T3.1A,FS   NV0206
dlog(M0) = dlog(GDPM£) ;
*C Holdings of M4 by PNFCs                             VQSH  T3.1G,FS   AT1009
ratio(M4IC) = ratio(GDPM£) ;
*C Holdings of M4 by OFCs                              VQSJ  T3.1G,FS   AT1009
M4OFC = M4OFC(-1) ;
*C Broad money (M4), (FYSA)                               AUYN  T3.1G,FS   NV0206
M4 = DEPHH + M4IC + M4OFC ;
{======== Group 15: Income Account ==========================================}
*C Wages & salaries inc. benefits in kind           DTWM-ROYK    TA3,EA   NV0507
WFP = ADJW*PSAVEI*(EMS-ESLFS) + (52/4000)*CGWADJ*ERCG*ECG
+ (52/4000)*LAWADJ*ERLA*ELA ;
*C Mixed income                                    RNKX(ROYH)   TA12,EA   NV0106
ratio(MI) = ratio(WFP) ;
*C Employers' social contributions                       ROYK T6.1.4S,BB   NV1005
EMPSC  = EMPISC + CGASC + EMPNIC + EMPCPP ;
*C Compensation of employees                              DTWM    TA3,EA   NV1105
FYEMP = WFP + EMPSC ;
*C Employers' imputed social contributions               NQDK T6.1.4S,BB   NV1005
EMPISC = HHISC + LASC + CGISC + 0.0086*WFP ;
*C Household imputed social contributions                RVFH T6.1.4S,BB   NV1005
ratio(HHISC) = ratio(WFP) ;
*C Household social benefits                             QWMZ T6.1.4S,BB   NV1005
HHSB = 2*HHISC ;
*C HH private funded social benefits (pensions)          RNLL T6.1.4S,BB   RA0108
ratio(OSB) = ratio(PCE)*ratio(GAD3) ;
```

```
*C Household social benefits                              RPHL T6.1.4S,BB   NV1005
SBHH = EMPISC + OSB + (HHSB - HHISC) + CGSB + LASBHH + EESCLA + EESCCG +
       CGASC - BENAB ;
*C Household current taxes on income & wealth       RPHS+RPHT   TA38,EA   NV1105
TYWHH = TYEM + TSEOP + CC + CGT + OCT - NPISHTC ;
*C Net misc. transfer receipts of HH (&NPISH)       RPHO-RPID T6.1.4,BB   RA0807
NMTRHH = LAOTRHH + (CGOTR-HHTCG) + (HHTFA-HHTA) + (EUSF-GNP4) + 100 ;
*C Total interest payments of HH (&NPISH) ex. FISIM      J4X3   TX15,--   AT0909
DIPHHx = DIPHH + DIPHHmf + DIPHHuf ;


*C Total interest payments of HH (&NPISH): mortgage FISIM   HMT   ----    AT0911
DIPHHmf =  LHP(-1)*((1 + (RMORT - R)/100)^0.25 - 1) ;

*C Total interest payments of HH (&NPISH): unsecured mortgage FISIM  IV8X-DIPHHmf
AT0911
DIPHHuf =  OLPE(-1)*((1 + (RS + 6.5 - R)/100)^0.25 - 1) ;

*C FISIM adjsutment in HH disposable income                HMT     ----    AT0911
FSMADJ = ifge(201203)*( (DIRHHf - obs(DIRHHf,201203))
+ (DIPHHuf - obs(DIPHHuf,201203)) ) ;

*C Total interest payments of HH (&NPISH)                ROYU   TA37,EA   AT0909
DIPHH = ( LHP(-1) + OLPE(-1) )*( (1 + (0.9*R + 0.2)/100 )^0.25 - 1) ;

*C Total interest receipts of HH (&NPISH) ex. FISIM      J4X2   TX15,--   AT0909
DIRHHx = DIRHH - DIRHHf ;

*C Total interest receipts of HH (&NPISH): FISIM         IV8W   TX15,--   AT0909
DIRHHf = -( 0.75*DEPHH(-1)*((1+(RDEP - R)/100)^.25-1) );


*C Total interest receipts of HH (&NPISH)                ROYM   TA37,EA   AT0909
DIRHH = DEPHH(-1)*((1 + R/100)^.25 - 1) + DIPNSC
      + 0.018279*DIPLDC + 0.014*CIPD + 11137*(RS/400);

*C Total interest receipts of PNFCs ex. FISIM      I6PB   TX15,--   AT1009
DIRICx = DIRIC - DIRICf ;

*C Total interest receipts of PNFCs: FISIM         IV87   TX15,--   AT1009
DIRICf = -((2.75)*M4IC(-1)*(((1 + (0.9*R - 0.2 - R)/100)^.25) - 1) ) ;
*C Total interest receipts of PNFCs                ROAY   TA20,EA   AT1009
DIRIC = M4IC(-1)*( ((1 + R/100)^0.25) - 1) + M4IC(-1)*1.75*( ((1 +
(ROSHT+0.2)/100)^0.25) - 1)
+ M4IC(-1)*0.35*( ((1 + (RS+0.2)/100)^0.25) - 1) ;
*C Total interest payments of PNFCs ex. FISIM      I6PK   TX15,--   AT1009
```

```
DIPICx = DIPIC + DIPICf ;
*C Total interest payments of PNFCs: FISIM         IV86   TX15,--   AT1009
DIPICf = STLIC*( ((1 + (RIC - R)/100)^0.25) - 1)
       + FXLIC*( ((1 + 2.9/100)^0.25) - 1) ;
*C Total interest payments of PNFCs                ROCG   TA20,EA   AT1009
DIPIC = STLIC*( ((1 + R/100)^0.25) - 1) + FXLIC*( ((1 + (ROSHT - 0.3)/100)^0.25) - 1)
+ BLIC*( ((1 + (RL + 0.5)/100)^0.25) - 1);

*C Withdrawals of income from quasi-corporations, D422   NBOJ   TA20,EA   NV1108
ratio(WYQC) = ratio(FYCPR) ;
*C Dividend receipts of HH (&NPISH), D421               NRKU T6.1.3,BB   AT1109
NDIVHH = (0.00313 - 0.0000418*ifle(200101)*(58-time(198701)) +
0.177335*(FYCPR+FISIM£)/EQLIC +
0.26244*NDIVHH(-1)/EQHH(-1) + 0.31897*NDIVHH(-3)/EQHH(-3) -
0.1335*((FYCPR(-4)+FISIM£(-4))/EQLIC(-4))*EQHH) ;
*C Attributed property income of ins. policy holders     ROYP   TA37,EA   NV1008
*W RPIH = 0.118*400*(DIPLDC+IILG+ILGUP)/(CGGILTS+MKTIG)
       + 0.129*(0.5 + 400*(DIPLDC+IILG+ILGUP)/(CGGILTS+MKTIG) )
       + 0.166*ROLT + 0.339*400*(NDIVHH/EQHH(-1))
       + 0.182*400*(NDIVHH/EQHH(-1)) + 0.043*RS
       + 0.023*ROSHT ;
APIIH = PIHH(-1)*(0.7651*(APIIH(-1)/PIHH(-2)) + 0.2349*RPIH/400 +
(0.0114/400)*ifle(199804)
 - (0.2863/400)*ifge(199901) + ((0.49/400)*(1 - 0.7651)*ifge(200804)) ) ;

*C Property income rec'd by HH (&NPISH)                  ROYL   TA37,EA   NV1005
PIRHH = NDIVHH + APIIH + DIRHH + WYQC ;
*C Property income paid by HH (&NPISH)                   ROYT   TA37,EA   NV1005
PIPHH = DIPHH ;
*C Employees' contributions to funded pension schemes    RNNN T6.1.4S,BB   RA0707
ratio(EECPP) = ratio(WFP) ;
*C Employees' social contributions                  RPHX+RPHY   TA38,EA   NV1105
EESC = EESCLA + EENIC + EECPP + EESCCG ;
*C Household disposable income                           RPHQ   TA38,EA   NV1105
HHDI = MI + FYEMP - EMPSC - EESC - TYWHH + NMTRHH  + SBHH + (PIRHH - PIPHH + FSMADJ)
     - HHSB + HHISC + (EECOMPC - EECOMPD) + OSHH ;
*C Real household disposable income                      NRJR   TA38,EA   NV1105
RHHDI = 100*HHDI/PCE ;
*C Employers' contributions to funded pension schemes   RNNG T6.1.4S,BB   NV1105
ratio(EMPCPP) = ratio(WFP) ;
```

```
*C Adj. for change in net equity of HH pension funds     RPQJ   TA40,EA   NV1105
NEAHH = EMPCPP + EECPP - OSB ;
*C Household (&NPISH) gross saving                       RPQL   TA40,EA   NV1105
SVHH = HHDI + NEAHH - C£ ;
*C Households' saving ratio                              NRJS   TA40,EA   NV1105
SY = 100*(SVHH/(NEAHH+HHDI)) ;
*C Net capital transfers of HH (&NPISH)   RPVO+RPVP-RPVS-RPVT   TA41,EA   NV1005
KGHH = - INHT + MIKTFA - MIKTA + 0.95*KLA + 0.55*KCGPSO + 0.4*EUKT ;
*C Net lending (from capital account): HH (SA)               RPZT   TA41,EA   NV1005
NAFHH = SVHH + KGHH - DINVHH - VALHH - NPAHH - IHH£ ;
*C Net lending (from capital account): Companies (SA)   RPYN+RQBV   TA22,EA   NV1105
NAFCO = -NAFHH + CB + EUKT + (MIKTFA - MIKTA) - CGKTA - OPSKTA + NPAA
      + SDE£ - SDI + PSNBCY ;

*C Net lending (from capital account): FINCOs (SA)       RPYN   TA26,EA   AT0310
NAFFC = - 2640 + FISIM£ - NEAHH - BLEVY ;
*C Net lending (from capital account): PNFCs (SA)       RQBV   TA22,EA   NV1105
NAFIC = NAFCO - NAFFC ;
*C Company gross saving: PNFCs & FINCOs             RPKZ+RPPS   TA22,EA   NV1105
SAVCO = NAFCO + KGHH - DINVHH + DINV£ - DINVCG + VAL£ - VALHH - NPAHH
      + IF£ - IHH£ - NPACG - CGI£ - KLA - KCGPSO - LAI£ - NPALA + INHT
      + KGLA - EUKT - MIKTFA + MIKTA + CGKTA + OPSKTA - NPAA - IPC£ - IBPC ;
{======== Group 16: Gross Domestic Product ==================================}
*C Total Final Expenditure at current prices             ABMF    TA2,EA   NV1205
TFE£  = CGG£ + C£ + DINV£ + VAL£ + IF£ + X£ ;
*C Statistical Discrepancy: GDP(E)                       GIXM    TA2,EA   NV1205
SDE£ = PGDP*SDE/100 ;
*C Gross Domestic Product at market prices               YBHA    TA2,EA   NV1205
GDPM£ = TFE£ - M£ + SDE£ ;
*C Gross Domestic Product at market prices NSA           BKTL    TA2,EA   NV1205
MGDPNSA = GDPM£ ;
*C Basic Price Adjustment at current prices   YBHA-ABML(NTAP)    TA1,EA   NV0307
BPA£ = (CETAX - BETPRF) + EXDUTAC + XLAVAT + LAVAT + TSD + TXMIS + ROCS
       - (EUSUBP + LASUBP + CGSUBP + CCLACA) + BANKROLL + BLEVY ;
*C Gross Value Added at basic prices                     ABML    TA1,EA   NV1205
GVA£ = GDPM£ - BPA£ ;
*C Total Final Expenditure at constant prices            ABMG    TA2,EA   NV1205
TFE  = CGG + C + DINV + VAL + IF + X ;
*C Statistical Discrepancy: GDP(E)                       GIXS    TA2,EA   NV1205
SDE = SDE(-1) ;
```

```
*C Gross Domestic Product at market prices, CVM          ABMI    TA2,EA   NV1205
GDPM = TFE - M + SDE ;
*C Basic Price Adjustment, CVM                           NTAO    TA1,EA   NV1205
ratio(BPA) = ratio(GDPM) ;
*C Gross Value Added at basic prices, CVM                ABMM    TA1,EA   NV1205
GVA = GDPM - BPA ;
*C Gross Value Added deflator                            CGBV    TA1,EA   NV1205
PGVA = 100*GVA£/GVA ;
*C Gross Domestic Product deflator                       YBGB    TA1,EA   NV1205
PGDP = 100*GDPM£/GDPM ;
*C Taxes less subsidies on production               CMVL-NTAP    TA1,EA   NV1108
TPROD£ = NNDRA + NIS + VEDCO + OPT + LAPT + EUETS
       - CGSUBPR - LASUBPR - EUSUBPR ;
*C Taxes less subsidies on production, CVM          ABMM-YBHH    TA1,EA   NV1205
ratio(TPROD) = ratio(GVA) ;
*C Gross Domestic Product at factor cost, CVM            YBHH    TA1,EA   NV1205
GFC = GVA - TPROD ;
*C Statistical Discrepancy: GDP(I)                       GIXQ    TA3,EA   NV1205
SDI = SDI(-1) ;
*C Whole economy Gross Operating Surplus                 ABNG   TA11,EA   NV1205
OS = GDPM£ - FYEMP - MI - BPA£ - TPROD£ - SDI ;
*C Private sector companies rental income           DTWR+DTWS    TK1,QA   NV1205
ratio(RENTCO) = ratio(GDPM£) ;
*C Household & NPISH Gross Operating Surplus             CAEN   TA11,EA   NV1205
*W IROO = (PRENT*POP16)/1000 ;
OSHH = (12874 + 0.85*IROO - DIPHHmf ) ;
*C FISIM totals

*C FISIM generated from General Government     C6GA+C6G9+C6FQ+C6FP   TX15,--   NV0209
FISIMGG = 0 ;
*C FISIM generated from Rest of World                   IV8F+IV8E   TX15,--   NV0209
FISIMROW = FISIMROW(-1) ;
*C Total nominal FISIM                                    IE9R      ----   NV0209
FISIM£ = (DIRHHf + DIPHHuf + DIPHHmf) + (DIRICf + DIPICf) + FISIMGG + FISIMROW ;

*C Profits
*C Gross trading profits of all private companies      CAED+CAGD+RITQ   TA11,EA   NV1205
FYCPR = OS - OSHH - OSGG - OSPC - RENTCO + SA - FISIM£ ;
OSCO  = OS - OSHH - OSGG - OSPC ;
```

```
*C GTP of non-oil corporations                                CAED      =HMT   NV0908
NNSGTP = FYCPR - GTPFC - NSGTP ;
*C Gross Trading Profits: FINCOs                              RITQ      TX8,EA NV0209
GTPFC = GTPFC(-1) ;
*C Total FINCO profits                                             IE9R+RITQ TX8,EA AT0909
FC = FISIM£ + GTPFC ;
*C Gross National Income at market prices                     ABMZ   T1.2,BB   NV1205
GNI£ = GDPM£ + NIPD + (EECOMPC-EECOMPD) + (EUSUBPR+EUSUBP) - (EUOT+EUVAT) ;
*C Non-North sea GVA                                          KLS2    TA2,QA   NV0607
NNSGVA = GVA - NSGVA ;
*C Trend output                                                     =OBR   TP0913
TRGDP = TRGDP(-1) ;
*C Output gap                                                       =OBR   NV0407
GAP = NNSGVA/TRGDP*100-100 ;
{======== Market sector GVA satellite  ====================================}
*C Nominal General Govt GVA                           NMXS+NTAR T5.1.2,BB   AT0310
GGVA£ = CGWS + LAWS + OSGG ;
*C Nominal Market sector GVA                  ABML-NMXS-NTAR      =HMT   AT0310
MSGVA£ = GVA£ - GGVA£ ;
*C General Govt GVA, £ CVM                          ----      =HMT   NV0607
ratio(GGVA) = ratio(CGG) ;
*C Market sector GVA, £ CVM                         ----      =HMT   NV0607
MSGVA = GVA - GGVA ;
{======== Group 18: Financial Account and Financial Balance Sheet
====================================}


'************ HOUSEHOLDS ************************************************************
*C Net lending (from capital account): HH (NSA)             NSSZ   TA41,EA   AT0110
NAFHHNSA = NAFHH + NAFHH(-1) + NAFHH(-2) + NAFHH(-3) - NAFHHNSA(-1) - NAFHHNSA(-2) -
NAFHHNSA(-3) ;
*C Net lending stat. discrp. between capital and fin a/c: HH (NSA) NZDV TA53,EA  AT0110
SDLHH = 0 ;
*C Net lending (from financial account): HH (NSA)           NZDY    TA53,EA  AT0110
NLHH = NAFHHNSA - SDLHH ;
'********** HOUSHOLDS: FINANCIAL ASSETS ****************************************

*C Currency and deposit assets: HH (NSA)                    NNMP    TA64,EA  AT0810
*W GMF = (PD*APH*0.858)/DEPHH(-1) ;
dlog(DEPHH) = 0.4432*dlog(C£) + 0.0170*(diff(RDEP) - diff(R))
```

```
+ 0.3427*GMF - 0.0346*(log(DEPHH(-1)) - 1.4837*log(C£(-1)) - 0.0417*RDEP(-1) + 4.6694) ;
*C Net acqusition of equity assets: HH (NSA)                NFXV    TA53,EA  AT0810
NAEQHH = 0.4560*NLHH - 3681 ;

*C Stock of equity assets: HH (NSA)                         NNOS    TA64,EA  AT0810
EQHH = ( 1 + 0.830*(ratio(EQPR) - 1)
        + 0.170*(ratio(WEQPR)/ratio(RX) - 1) )*EQHH(-1) + NAEQHH ;

*C Net acquisition of pension & insuance assets: HH (NSA)   NPWX    TA53,EA  AT0810
NAPIHH = 2402 + 1.235*diff(NEAHH) + 0.229*NAPIHH(-1) + 0.93*NEAHH(-1) ;

*C Stock of pension & insurance assets: HH (NSA)            NPYL    TA64,EA  AT0810
PIHH = ( 1 + 0.314*(ratio(EQPR) - 1) + 0.168*(RX(-1)/RX - 1)
        + 0.162*(ratio(WEQPR)/ratio(RX) - 1) )*PIHH(-1) + NAPIHH ;

*C Other assets: HH (NSA)                           NNMY+NNOA+NNPM TA64,EA  AT0810
ratio(OAHH) = ratio(HHDI(-1)) - 0.0029 ;

*C Total net acquisition of financial assets: HH (NSA)              NFVO    TA53,EA
AT0110
AAHH = diff(DEPHH) + NAEQHH + NAPIHH + diff(OAHH) ;

*C Total HH financial assets (NSA)                          NNML    TA64,EA  AT0110
GFWPE = DEPHH + EQHH + PIHH + OAHH ;

'************ HOUSEHOLDS: FINANCIAL LIABILITIES ******************


*C Total net acquisition of financial liabilities: HH (NSA) NFYS    TA53,EA  AT0110
ALHH = AAHH - NLHH ;
*C HH liabilites secured on dwellings (NSA)                         NNRP    TA64,EA
AT1109
LHP = LHP(-1);
*C HH other financial liabilities (NSA)                       NNPP-NNRP    TA64,EA
NV0206
diff(OLPE) = ALHH - diff(LHP) ;


'******** AGGREGATES *****************

*C HH net financial assets (NSA)                               NZEA    TA64,EA    AT0110
NFWPE = GFWPE - LHP - OLPE ;

*C Gross physical wealth of HH&NPISH                    See model doc T10.10,BB    NV1005
GPW = 0.9933*GPW(-1)*APH/APH(-1) + .001*IHH£ ;


'************ REST OF WORLD ************************************************************
```

```
*C Net lending (from capital account): ROW (NSA)            NHRB   TA42,EA   AT0810

NAFROWNSA = NAFROW + NAFROW(-1) + NAFROW(-2) + NAFROW(-3) - NAFROWNSA(-1) - NAFROWNSA(-
2) - NAFROWNSA(-3) ;

*C Net lending stat. discrp. between capital and fin a/c: HH (NSA) NYPO TA54,EA  AT0810

SDLROW = 0 ;

*C Net lending (from financial account): HH (NSA)           NYOD    TA54,EA  AT0810

NLROW = NAFROWNSA - SDLROW ;



'************ EXTERNAL BALANCE SHEET: FINANCIAL ASSETS OF
ROW*********************************

*C Stock of ROW Direct Investment claims on UK (NSA)        HBWI    TA8.1,PB  AT0810

diff(DAROW) = (0.3813*(X£+M£)/TFE£ + 0.7067*ICC£/TFE£ - 0.1872)*TFE£ ;

*C Stock of ROW portfolio equity claims on UK (NSA)         HLXX    TA8.1,PB  AT0810

EQAROW = EQAROW(-1)*ratio(EQPR) + NAEQAROW ;

*C Acquisition of ROW portfolio equity claims on UK (NSA)   XBLW    TA7.1,PB  AT0810

NAEQAROW = (distlag(EQAROW(-1),4,0.25)/(distlag(EQAROW(-1),4,0.25) + distlag(BAROW(-
1),4,0.25)) )

*(AAROW - diff(DAROW) - NAOTAROW) ;

*C Stock of ROW portfolio debt claims on UK (NSA)           HLXY    TA8.1,PB  RKF1112

BAROW = BAROW(-1)*(0.40/ratio(RX) + (1 - 0.40) ) + NABAROW ;

*C Acquisition of ROW portfolio debt claims on UK (NSA)             XBLX    TA7.1,PB
RKF1112

NABAROW = (distlag(BAROW(-1),4,0.25)/(distlag(EQAROW(-1),4,0.25) + distlag(BAROW(-
1),4,0.25)) )

*(AAROW - diff(DAROW) - NAOTAROW) ;

*C Stock of ROW Other claims on UK (NSA)                    HLYD    TA8.1,PB  AT0810

OTAROW = OTAROW(-1)*(0.84/ratio(RX) + (1 - 0.84) ) + NAOTAROW ;


*C Acquisition of ROW Other claims on UK (NSA)                      XBMN    TA7.1,PB
AT0810

NAOTAROW = NAOTLROW ;


*C Total stock of ROW claims on UK (NSA)                    HBQB-JX97 TA8.1,PB  AT0810

AROW = DAROW + EQAROW + BAROW + OTAROW ;


*C Total acquisition of ROW claims on UK (NSA)                      HBNS    TA7.1,PB
AT0810


AAROW = ALROW + NLROW ;
```

```
'************ EXTERNAL BALANCE SHEET: FINANCIAL LIABILTIES OF
ROW*******************************


*C Stock of UK Direct Investment claims on ROW (NSA)         HBWD   TA8.1,PB  AT0810

DLROW = DLROW(-1)/ratio(RX) + NADLROW ;

*C Acquisition of UK Direct Investment claims on ROW (NSA)  -HJYP   TA7.1,PB  AT0810

NADLROW = DLROW(-1)*( -0.0375 - 0.2124*DLROW(-1)/LROW(-1)

        - 0.2004*(FYCPR(-1) + FISIM£(-1))/EQLIC + 0.1026*ratio(WEQPR) ) ;

*C Stock of UK portfolio equity claims on ROW (NSA)          HEPX   TA8.1,PB  AT0810

EQLROW = EQLROW(-1)*ratio(WEQPR)/ratio(RX) + NAEQLROW ;

*C Acquisition of UK portfolio equity claims on ROW (NSA)   -HBVI   TA7.1,PB  AT0810

NAEQLROW = 0.196*NAPIHH + 0.132*NAEQHH + 0.003*GDPM£ ;

*C Stock of UK portfolio debt claims on ROW (NSA)            HHZX   TA8.1,PB  AT0810

BLROW = BLROW(-1)/ratio(RX) + NABLROW ;

*C Acquisition of UK portfolio debt claims on ROW (NSA)             -XBMW   TA7.1,PB
AT0810

NABLROW = 0.17*NAPIHH + 0.0325*GDPM£ ;


*C Stock of UK Other claims on ROW (NSA)                    HLXV   TA8.1,PB  AT0810

OTLROW = OTLROW(-1)*( 0.90/ratio(RX) + (1 - 0.90) ) + NAOTLROW ;


*C Acquisition of UK Other claims on ROW (NSA)                      -XBMM   TA7.1,PB
AT0810

NAOTLROW = OTLROW(-1)*(ratio(GDPM£) - 1) ;


*C Total stock of UK claims on ROW ex reserve assets (NSA) HBQA-LTEB-JX96   TA8.1,PB
AT0810

LROW = DLROW + EQLROW + BLROW + OTLROW ;


*C Total acquisition of UK claims on ROW (NSA)                      -HBNR   TA7.1,PB
AT0810

ALROW = NADLROW + NAEQLROW + NABLROW + NAOTLROW - DRES ;


'******** AGGREGATES ******************

*C UK Net international investment position                HBQC    TA8.1,PB  AT1010

diff(NIIP) = diff(LROW) + diff(SRES) - diff(AROW) ;


'*****PNFC BALANCE SHEET MODEL*******

'*****LIABILITIES - STOCKS****

*C Stock of bonds and Money Mkt instruments issued by PNFCs    NKZA  TA57,EA  AT1009

BLIC = BLIC(-1) + NABLIC ;

*C Stock of FINCO sterling Bank lending to PNFCs               NLBE-NLBG TA57,EA  AT1009
```

```
STLIC = STLIC(-1) + 0.09*NALIC ;

*C Stock of FX Bank lending to PNFCs                    NLBG+NLBI TA57,EA   AT1009

FXLIC = FXLIC(-1)*( RX(-1)/RX ) + NAFXLIC ;

*C Stock of shares issued by PNFCs                      NLBU      TA57,EA  AT1009

EQLIC = EQLIC(-1)*( EQPR/EQPR(-1) ) + NAEQLIC ;

*C Stock of other financial liabilities issued by PNFCs      NLCO+(NLBC-NLBE-NLBI)
TA57,EA AT1111

OLIC = OLIC(-1) + 0.04*NALIC ;

*C Total stock of financial liabilities of PNFCs ;  NLBB    TA57,EA AT1009

LIC = BLIC + STLIC + FXLIC + EQLIC + OLIC ;

'****LIABILITIES - FLOWS***

*C Net issuance of bonds & MMIs by PNFCs            NETR    TA46,EA        AT1009

NABLIC = 0.14*NALIC ;

*C Flow of FX lending to PNFCs                              NEUX+NEUZ   TA46,EA
AT1009

NAFXLIC = 0.07*NALIC ;

*C Net issuance of shares by PNFCs                  NEVL    TA46,EA        AT1009

*W PER = EQLIC/(FYCPR+FISIM£) ;

NAEQLIC = (1.6035 + 0.9385*PER(-1))*(FYCPR+FISIM£) - EQLIC(-1)*ratio(GDPM£) ;


*C Total net acquisition of financial liabilities by PNFCs  NETE    TA46,EA        AT1009

NALIC = -27362 + 1.513178*IBUS*(PIF/100) ;

'***ASSETS - STOCKS***

*C Stock of financial assets held by PNFCs       NKWX                       T12.1d,FS
AT1009

AIC = AIC(-1) + (NAAIC - diff(M4IC)) ;

'***ASSETS - FLOWS***

*C Net acquisition of financial assets by PNFCs              NEQA          TA46,EA
AT1009

NAAIC = AIC(-1)*(ratio(GDPM£) - 1) ;


*C PNFC Net wealth                                          NYOT           T12.1D,FS
AT1009

NWIC = AIC - LIC ;
```

ISBN 978-1-909790-28-5