RESURRECTING THE UK HISTORIC SECTOR NATIONAL ACCOUNTS

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Abstract
The UK national accounts do not provide a full long-run set of historic data describing the behaviour of the UK's private sector. Although comprehensive figures are available from 1987, the pre-1987 historic sector national accounts are marred by discontinuities, gaps and error.

A partial solution is described that enables the compilation of consistent historic figures for sectors' income and expenditure flows, albeit at a high level of sector aggregation. Particular attention is paid to transfer incomes and associated inter-sector flows.

To our knowledge, our dataset is the only one freely available that provides a basis, albeit an incomplete one, for a serious examination of Britain's post-war macroeconomic history. Coherent financial flow, balance sheet and volume data and further sector disaggregation are required to complete the picture.

An annual dataset is provided as a supplement to the article: www.cbr.cam.ac.uk/people/martin_bill.htm

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1 Introduction

The UK national accounts do not provide a sufficiently complete set of historic data to enable serious long-run analysis of the economic behaviour of the UK's private sector of households and corporations. Figures for all national account sectors - public, overseas as well as private - covering income, expenditure and financial flows and related balance sheets are available from 1987. But before 1987, the sector dataset is marred by discontinuities, gaps and error. Historic balance sheet figures are sporadic while historic sector accounts for income and spending flows are not fit for analytical purposes.

These problems are surprising. The UK's official statistical agency, the Office for National Statistics (ONS)[i], has long regarded the sector accounts as "an essential framework of the integrated economic accounts of the nation" (Turnbull (1993)). Moreover, economists since at least Christ (1968) have emphasised the importance of the relationship between sectors' wealth stocks and related income and expenditure flows. Alas, the maintenance of the historic sector statistical record has received low priority.

Resource constraints are partly to blame, notably for the incomplete figures on wealth and financial flows. More specific problems that have afflicted the historic record of sector income and expenditure flows partly arose from the 1998 conversion of the UK national accounts to the statutory standard set by the European System of Accounts of 1995 (ESA95). Prior to conversion, full sector income and expenditure flow data were available annually from 1948 and quarterly from 1963 in the ONS quarterly publication, UK Economic Accounts (UKEA). After conversion, pre-1987 sector flow data in the UKEA were largely limited to the public and non-financial corporations sectors. These data subsequently became corrupted, partly as a result of the inability of official statisticians to perform full across-economy consistency checks.

In June 2007, the ONS watchdog, the Statistics Commission, upheld the author's severe criticisms of the (pre-1987) historic sector national accounts (HSNA) (Martin (2007a, 2007b), Statistics Commission (2007))[ii]. The Commission noted:

".. the [author's] memorandum provides incontrovertible evidence of data corruption for pre-1987 data amongst the individual time series of the sector national accounts. Moreover the number of corrupted data series identified in the memorandum looks to be much too large for a dataset (the sector national accounts) that is classified as National Statistics."

Having originally rebutted the author's criticisms (ONS (2007)), the ONS conceded that the HSNA were "not fit for purpose" (Statistics Commission (2007), paragraph 8). Responding to the Statistics Commission's recommendations, the ONS deleted pre-1987 figures from over one hundred series in the 2007 national accounts Blue Book dataset and culled additional data in subsequent UKEA releases.

The first main data cull by the ONS focussed on households and private non-financial corporations, leaving threadbare the already patchy UKEA historic record of the private sector. Additional series were deleted in later UKEA releases, including pre-1987 data for the public and overseas sectors. The ONS issued a statement informing users of the cull of those data "..identified as corrupt and therefore no longer of sufficient quality to be useful for making long run comparisons..".[iii]

The author has pressed for a full reinstatement of the HSNA and, failing that, for the repair, rather than simple deletion, of corrupted series, especially for the public sector (Martin (2007 b)). The ONS has rejected the first suggestion, stating, "it is not practical within existing resources to complete the ESA95 conversion for the pre-1987 dataset" (Statistics Commission (2007)). Discussions regarding the more limited repair of the UKEA historic public sector data are continuing.

As a "fall-back", the ONS said it would consider making available a data archive containing the pre-ESA95 1997 Blue Book. In the opinion of the ONS, this " would allow users to … view ESA79 data for years to 1996 in parallel with ESA95 data from 1987 and … to join the two datasets" (Statistics Commission (2007)). Recognising its usefulness as a source of hard-to-find individual series, Martin (2007b) nevertheless provides evidence that strongly contests the ONS notion that the 1997 Blue Book data could be used effectively as an historic database "fall-back".

Although the ONS will continue regularly to maintain historic series for the gross domestic product and its main components, the gaps, current and prospective, in the official sector record are debilitating. Fortunately, there are alternatives. The Organisation for Economic Co-operation and Development is undertaking, with others, a project to backfill balance sheet information in a number of countries, including the UK (Sbano and Chavoix-Mannato (2006)). For the UK, this exercise involves the linking of balance sheet data compiled under different standards; no attempt has been made to examine the corresponding flow data.

It is the aim of this article to show that missing historic sector income and expenditure flow data can be reliably backfilled for the UK, albeit at a high level of sector aggregation. The backfilling rests on the integration of the national sector accounts, as published in the UKEA, with more reliable official historic data available from, but differently presented in, the public sector accounts and the balance of payments accounts. The task requires detailed accounting knowledge of the kind that professional ONS statisticians possess but, in this context, do not currently deploy.[iv]

After rehearsing the relevant accounting identities, this article describes in detail the manner in which the pre-1987 annual current price flow data in the HSNA can be resurrected at a three-sector level: specifically, the private, public and overseas (or "Rest of the World") sectors. Particular attention is paid to transfers receipts and payments and the associated inter-sector flows. We show that the resurrected historic sector national accounts are materially different from those in the 1997 Blue Book.

It may be noted in passing that historic data can be derived at a finer level of sector disaggregation. The household sector can be separated from the private corporate sector, and non-financial corporations can be separated from financial corporations. However, the more detailed pre-1987 sector decomposition necessarily relies on a dubious ONS series for households' disposable income,[v] requires extensive estimation of households' capital account, and infers corporations' disposable incomes and expenditure by residual. Further disaggregation within the corporate sector involves use of suspect data for non-financial corporations. It is also possible to derive quarterly seasonally adjusted series before 1987, but these require extensive use of seasonal adjustment methodology and a willingness to interpolate annual data where quarterly figures are missing.

Here the focus is on annual aggregate sector data that can be derived with the minimum of estimation and with the greatest degree of confidence.

2 Income, sectors and accounting identities

A few preliminary words are required on rival concepts of income. The ESA95 emphasises the notion of a sector's "primary" income, defined as any income that arises from involvement in production and from the ownership of productive assets. ESA95 primary incomes thus include factor incomes (incomes, such as wages and profits, that accrue to factors of production), net indirect taxes (such as value added tax (VAT)) and net property incomes (such as interest and dividend income). The ESA95 accounts, radically different from earlier UK presentations based on the United Nations' System of National Accounts (SNA) of 1968, show in a cascading fashion how the balance of a sector's primary income is distributed as a result of other transfer receipts and payments, such as direct taxes, social contributions and welfare benefits.[vi]

Although the notion of primary income has its uses, it conflates factor incomes with property incomes, which are another type of income transfer paid out of, or received in addition to, factor income.[vii] For our needs, it is more helpful to begin with the observation that, across all sectors, factor incomes sum to the economy's gross value added (GVA[viii]) while all transfer incomes (net of payments) sum to zero. It is this distinction that informs the accounting identities described below.

We consider three sectors: a "pri***v***ate" sector (comprising households, non-profit institutions serving persons (NPISH)[ix] and private corporations) denoted by the subscript "v"; a "***s***tate" or "public" or "government" sector (comprising central and local governments and public corporations) denoted by the subscript "s"; and a "Rest of the ***W***orld" sector, denoted by the subscript "w".

The Rest of the World sector is a fiction, albeit a convenient one, since no attempt is made to record all overseas incomes and expenditures. With few exceptions, the only transactions recorded are those that take place between UK residents and non-residents seen from the latter's perspective. A UK balance of payments credit (debit) scores as a debit (credit) in the Rest of the World accounts.

Private sector flow data missing from the UKEA before 1987 can be inferred from counterpart public sector and balance of payments information available from other official accounts. Data from these alternative sources are not presented in the same format but are, in principle, consistent with the ESA95. Public sector finance data, available from 1946, conform to the presentation in the UK Government's Financial Statement and Budget Report (FSBR[x]); balance of payments data, available in some cases from 1946, conform as far as possible to the format set by the IMF Balance of Payments Manual 5th Edition (BPM5).

The connexion between these data and the missing private sector data can be explained by manipulation of simplified national accounts identities:

$$GVA \equiv GVA_V + GVA_S + GVA_W \quad (1)$$

$$GDP(E) \equiv C_V + I_V + C_S + I_S + X - M \quad (2)$$

$$GVA + ERR \equiv GDP(E) - FCA_S - FCA_W \quad (3)$$

$$Z_V + Z_S + Z_W \equiv 0 \quad (4)$$

$$FS_V \equiv \{GVA_V + Z_V\} - (C_V + I_V) \quad (5)$$

$$FS_S \equiv \{GVA_S + Z_S + FCA_S\} - (C_S + I_S) \quad (6)$$

$$FS_W \equiv \{GVA_W + Z_W + FCA_W\} - (X - M) \quad (7)$$

$$FS_V + FS_S + FS_W + ERR \equiv 0 \quad (8)$$

Identity (1) equates the economy's GVA (measured at "factor cost", that is excluding indirect taxes and subsidies) with the sum of each sector's GVA:

- *Private sector GVA,* GVA_V, comprises the compensation of employees ($COMP$), itself the sum of wages and salaries and employers' contributions on behalf of their employees for social insurance and pensions,[xi] and other factor incomes (GOS). The latter include the mixed incomes (previously known as "self-employment incomes") of sole traders and the operating surpluses (essentially "profits" or "earnings" struck before deduction of net interest, tax or depreciation) of private corporations.[xii]

- *State GVA,* GVA_S, comprises the operating surpluses of general government (central and local governments combined) and public corporations. The general government's gross operating surplus is equal to depreciation ("consumption of fixed capital").

- *Rest of the World GVA,* GVA_w, comprises the compensation of non-residents employed in the UK less the compensation of UK residents employed overseas, often on temporary assignments.[xiii]

Identity (2) equates the expenditure measure of GDP ($GDP(E)$) (measured at "market prices", that is inclusive of indirect taxes and subsidies) with the sum of private and public final consumption (C), of capital expenditures (I)[xiv], and of UK exports of goods and services (X) less imports (M).[xv] Government consumption includes the compensation of government employees as well as government procurement. To simplify exposition, the identity ignores inter-sector transfers of land (DL) - formally known as net acquisitions of "non-produced, non-financial assets". These transfers sum to zero across the economy.

Identity (3) links GVA and the expenditure measure of GDP. The national accounts residual error (ERR), which captures the difference between the income and expenditures measures of GDP, is added to GVA at factor cost; the factor cost adjustment (FCA), comprising all indirect taxes (less subsidies) on production and imports, is deducted from $GDP(E)$ at market prices. The identity distinguishes between the indirect taxes and subsidies that accrue to government and those that accrue to the Rest of the World. Customs duties and VAT levied on imports and paid to the European Union less UK receipts from the EU agricultural guarantee fund form part of the Rest of the World factor cost adjustment.

Identity (4) expresses the fact that the transfer incomes (Z) of the three sectors sum to zero. Transfer incomes are defined here to include capital account items, such as investment grants and capital taxes, as well as items on current account, like property income and social welfare.

Identities (5) to (7) define each sector's financial surplus (FS), also known as "net lending", as the difference between disposable income and expenditure. Disposable income components (shown within curly parentheses) comprise factor and transfer incomes, including capital transfers – a departure from the standard national accounts definition of disposable income, which is confined to items on current account.[xvi] Also included as part of state and Rest of the World sectors' disposable incomes are their receipts of indirect taxes less payment of subsidies. Limited to transactions between residents and non-residents, the Rest of the World account records expenditure as UK exports less imports.

Identity (8), the corollary of the preceding identities, shows that the sum of sectors' financial surpluses or net lending is zero after allowance for the national accounts residual error. Re-arranged, and ignoring the error term, net lending of the private sector is shown to be equal to the net borrowing of the public and the Rest of World sectors. Apart from certain capital transfers, the latter is equal to the current account surplus on the UK balance of payments. In financial account terms, the private sector's acquisition of financial assets less liabilities is equal to the sum of the public sector's issuance of net debt and the UK's acquisitions of financial assets overseas net of non-residents' acquisition of UK financial assets.

A useful additional identity comes from the summation of sectors' disposable incomes (YD):

$$YD_V + YD_S + YD_W \equiv GDP(E) - ERR \qquad (9)$$

where:

$$YD_V \equiv GVA_V + Z_V$$
$$YD_S \equiv GVA_S + Z_S + FCA_S$$
$$YD_W \equiv GVA_W + Z_W + FCA_W$$

It follows from identity (9) that the private sector's disposable income and expenditure can be inferred from knowledge of the expenditure measure of GDP, the residual error and the disposable incomes and expenditures of the state and Rest of the World sectors.

Re-arrangement of identity (9) gives the private sector's disposable income as:

$$YD_V \equiv GDP(E) - ERR - YD_S - YD_W \qquad (10)$$

Re-arrangement of identity (2) gives the private sector's total expenditure (E_V) as:

$$E_V \equiv C_V + I_V \equiv GDP(E) - \{C_S + I_S + X - M\} \qquad (11)$$

The private sector's financial surplus is simply defined by:

$$FS_V \equiv YD_V - E_V \qquad (12)^{xvii}$$

Two refinements can be usefully introduced. First, as an alternative to the private sector, we construct a "market sector" from the summation of the private and public corporations sectors. The counterpart sectors are the Rest of the World, as before, and the general government sector (the summation of central and local government sectors). The usefulness of the market sector arises from the fact that it is unaffected by the history of UK nationalisations and privatisations that severely distort the boundary of the public and private sectors.

Second, for both the private and market sectors, we introduce an adjusted measure of disposable income (YDX), derived by adding the national accounts residual error to observed disposable income. The underlying assumption is that the estimation errors that create the gap between the income and expenditure measures of GDP are most likely to arise from errors in the measurement of private sector flows.

In the case of the private sector:

$$YDX_V \equiv YD_V + ERR \tag{13}$$

$$YDX_V \equiv GDP(E) - YD_S - YD_W \tag{14}$$

The adjusted private sector financial surplus (FSX) is defined by:

$$FSX_V \equiv FS_V + ERR \tag{15}$$

By implication, the following relationships also hold:

$$FSX_V \equiv YDX_V - E_V \tag{16}$$

$$FSX_V + FS_S + FS_W \equiv 0 \tag{17}$$

3 Transfer incomes: consolidation and inter-sector flows

Since the national accounts provide historic (and largely coherent) data for factor incomes and the main expenditure components of GDP, the need to infer private sector data from public and Rest of the World counterparts is largely confined to transfer receipts and payments. Historic data for private sector transfers are often seriously incomplete or have been corrupted in the UKEA.

Private sector transfers of each type are inferred by residual using their across-economy zero-sum property expressed in identity (4):

$$Z_V \equiv -\left(Z_S + Z_W\right) \tag{18}$$

This procedure is applied to the following categories of transfers:

- taxes on income and wealth, including capital gains tax ($YTAX$);
- other current taxes, including some duties and local taxes ($OTAX$);
- taxes levied irregularly on the value of assets, including inheritance tax ($KTAX$);
- the balance (SBB) of social insurance contributions (SC), including compulsory contributions (ECC), and social benefits (SB), including pensions;
- the adjustment for the net equity of households in pension fund reserves, which measures the excess of private pension contributions over payments (PE);[xviii]
- the balance ($OCTB$) of other current transfers credits ($OCTC$) and debits ($OCTD$), which include a miscellany of transfers such as net non-life insurance premiums and claims, payments to, and receipts from, the European Union, and education grants;
- the balance ($OKTB$) of miscellaneous capital transfer credits ($OKTC$) and debits ($OKTD$) such as investment grants and large compensation payments;
- the balance of property incomes (PIB), comprising balances of interest income ($INTB$), of corporate distributions including dividends (CDB), of reinvested earnings on foreign direct investment ($RFEB$), of the property income attributable to insurance policy holders ($IPYB$) and, finally, of rent ($RENB$), which is largely confined to agricultural land rents and royalties arising from oil and gas exploration rights.

The convention is adopted of signing transfer credits positively and transfers debits negatively. Transfer balances are therefore equal to the *sum* of credits and debits and total private sector transfers are given by:

$$Z_V \equiv TTAX_V + SBB_V + PE_V + OCTB_V + OKTB_V + PIB_V \tag{19}$$

where:

$$TTAX_V \equiv YTAX_V + OTAX_V + KTAX_V \tag{20}$$

$$PIB_V \equiv INTB_V + CDB_V + RFEB_V + IPYB_V + RENB_V \qquad (21)$$

The same identities apply, mutatis mutandis, to all institutional sectors.[xix]

Two matters require further attention: sector consolidation, including the treatment of transfer credits and debits taken separately and, second, the identification of the source of sectors' transfer income.

Sectors' transfer credits and debits taken as separate items will not sum to zero across the economy. A tax *receipt* of the public sector, for example, will have as its counterpart a tax *payment* by the private sector but only the balance of tax receipts and payments sums to zero across sectors.

The same non-zero additive property arises if the transfers of one sector are calculated from the transfer credits and debits of sub-sectors. For example, (post-1987) private sector transfers calculated from the transfer credits and debits of households and corporations would include intra-private sector transfers between households and private corporations as well as transfers between these sectors and non-private sectors.

Ideally, intra-sector transfers should be removed in order to consolidate the aggregate sector, but the requisite information is typically unavailable. A practical solution is to calculate transfer balances – credits less debits - a procedure that automatically nets out intra-sector flows.

The second matter, the identification of the source of sectors' transfer income, becomes important if the generation of the transfer is dependent on sector-specific characteristics. Consider, for example, the property income surplus of the private sector, which comprises the net property income transfers received from the public sector and from the Rest of the World. These transfers are the product of the private sector's holdings of public and overseas assets and their respective rates of return. Since these returns may well differ, an understanding of developments in the private sector's property income requires a separation of the income by source.

The information required directly to identify such flows is incomplete.[xx] Fortunately, it is possible to infer the sector source of private sector transfers from knowledge of transfer balance flows that occur between the public and Rest of the World sectors. The procedure can be explained using a transfer matrix.

Let A^c be a matrix of one type of transfer (for example, a welfare benefit) showing credits received by sectors arranged across the columns and paid by the same sectors arranged down the rows. It is assumed that the three sectors are arranged in a set order: private, state and Rest of the World and that the first two sectors' accounts are unconsolidated.

The credit matrix may be written:

$$A^c \equiv \begin{pmatrix} a_{VV} & a_{VS} & a_{VW} \\ a_{SV} & a_{SS} & a_{SW} \\ a_{WV} & a_{WS} & 0 \end{pmatrix} \qquad (22)$$

a_{ij} denotes transfer credits received by the column (j) sector and paid by the row (i) sector. For example, a_{VS} is the transfer received by the state sector (middle column) and paid by the private sector (first row). The sum of all credits in each column is the column sector's observed total credit for this type of transfer, including any intra-sector credits shown along the leading diagonal.

Without change of sign, the associated matrix of debits (A^d) is the transpose (denoted by a dash) of the credit matrix, with sector payers arranged across columns and sector payees arranged down the rows:

$$A^d \equiv \left(A^c\right)' \equiv \begin{pmatrix} a_{VV} & a_{SV} & a_{WV} \\ a_{VS} & a_{SS} & a_{WS} \\ a_{VW} & a_{SW} & 0 \end{pmatrix} \qquad (23)$$

For example, in the debit matrix, a_{VS} appears as a debit of the private sector (first column) paid to the state sector (second row).

The subtraction of the debit matrix (23) from the credit matrix (22) gives the transfer balance matrix (*A)* for this type of transfer income:

$$A \equiv A^c - A^d \equiv A^c - \left(A^c\right)' \qquad (24)$$

The A transfer balance matrix is skew symmetric with a leading diagonal of zeros (that is, zero intra-sector transfer balances) and with the general property that:

$$\lambda' A \lambda \equiv 0 \qquad (25)$$

where λ is a column vector of ones.

Expression (25) says that transfer balances sum to zero across sectors.

In the three-sector case:

$$A \equiv \begin{pmatrix} 0 & -\left(a_{SV} - a_{VS}\right) & -\left(a_{WV} - a_{VW}\right) \\ a_{SV} - a_{VS} & 0 & -\left(a_{WS} - a_{SW}\right) \\ a_{WV} - a_{VW} & a_{WS} - a_{SW} & 0 \end{pmatrix} \qquad (26)$$

$\left(\lambda' A\right)_j$ defines the vector of total balances for this type of transfer accruing to each sector. Sector totals are denoted and defined by:

$$(\lambda' A)_V \equiv +\left(a_{SV} - a_{VS}\right) + \left(a_{WV} - a_{VW}\right) \qquad (27)$$

$$(\lambda' A)_S \equiv -\left(a_{SV} - a_{VS}\right) + \left(a_{WS} - a_{SW}\right) \qquad (28)$$

$$(\lambda' A)_W \equiv -\left(a_{WV} - a_{VW}\right) - \left(a_{WS} - a_{SW}\right) \qquad (29)$$

$$(\lambda' A)_V + (\lambda' A)_S + (\lambda' A)_W \equiv 0 \qquad (30)$$

These expressions show that it is possible to infer the private sector's transfer balances with each of the other sectors from the other sectors' balances and knowledge of the transfers that take place between them.

In particular, by eliminating the state-Rest-of-World inter-sector transfer balance $a_{WS} - a_{SW}$ both from identity (28), leaving $-\left(a_{SV} - a_{VS}\right)$ as the residual, and (with reverse sign) from identity (29), leaving $-\left(a_{WV} - a_{VW}\right)$ as the residual, the two separate sources of $(\lambda' A)_V$ are identified (with reverse sign). Information available from the balance of payments accounts makes this a feasible procedure for the three broad sectors used here but not for finer levels of sector disaggregation.

We now turn to the detail of the principal sources of counterpart private sector data to be found in the public finance and balance of payments accounts. The description takes as the "current" state of play the historic data made available in the September 2007 UKEA release consistent with the 2007 Blue Book.[xxi] The subsequent availability of historic figures is more restricted, the result of the ONS programme of sequential data deletions from the UKEA.

4 Public sector accounts

At the time of the 2007 Blue Book, long runs of annual data for central and local governments and public corporations were available both from the UKEA and from the public sector finances accounts. With some licence, we refer to the latter, published in "Financial Statistics" and on the ONS website, as the FSBR data.

According to the official table footnotes, the FSBR data shown in Financial Statistics are "consistent with the National Accounts".[xxii] In practice, this is not so. Revisions made by public sector accounts statisticians are frequently not carried back properly in the UKEA by national accounts statisticians. This problem should be confined to transfer incomes but examples exist of corrupted items, such as taxes on production and investment, which affect the gross domestic product.

Table 1 shows the results of a comparison of the two sources for historic data published in September 2007, consistent with the 2007 Blue Book. This comparison is of significance for two reasons. The annual Blue Book is typically the occasion that the statisticians reserve for long-run revisions to the UKEA.[xxiii] Secondly, by September 2007 the ONS was aware of the scale of the data corruption and had taken remedial action.

Table 1: Selected historic UKEA and FSBR data – years when they differ

Item	----------annual UKEA data versus public sector finance data ----------		
	Central government	Local government	Public corporations
Taxes on income and wealth	1960-1986	null**	1960
Other current taxes	1946-1986	1960-1962	null**
Gross operating surplus	1946-1947	1946-1954	1948-1954
Net current grants abroad*	1960-1986	same	null**
Current grants (net) within general government	1960-1962	1960-1962	null**
Other current grants	1960-1962; 1974-1986	same	null**
Social benefits balance*	1960-1962; 1974-1986	1960-1962	null**
Interest and dividends balance*	1963-1986	1963-1986	1984-1986
Gross fixed capital formation	1984-1986	1974-1991	1974-1991
Net lending	na	na	na

Source: Q2 2007 UKEA release (26 September 2007), PSAT2MatrixData, national accounts consistent (26 September 2007) available on request from the ONS. * These balances are calculated and should be the same in both sources. ** null series comprising zeros. na – not available.

It is clear from this comparison that there were still widespread differences between the two sources in September 2007. All the errors arose from UKEA data corruption. Although the differences mainly affected the record of transfers, such as taxes and grants, the record of some GDP components - gross operating surplus and fixed capital formation – was also corrupted.[xxiv] The best that can be said is that by September 2007 the ONS had succeeded in reducing the number of data errors, albeit partly by the expedient of deleting UKEA figures for net lending.[xxv] Instead of co-ordinating data input with the public sector statisticians, who work in a separate division within the ONS, the national accounts statisticians deleted rather than repaired some of the corrupted public sector data shown in Table 1 in a subsequent UKEA release.

This was an opportunity missed. Unlike the UKEA historic record, the public sector finance figures are comprehensive and coherent. The public sector data are closely scrutinised by the UK Treasury department as part of its responsibilities for the conduct of the government's fiscal policy.

Since the FSBR data are of higher quality, one solution would be to use these data in preference to the UKEA figures throughout. But this substitution would have disadvantages. On occasions, GDP might thereby be re-stated. In addition, internal consistency of the three-sector resurrected national accounts dataset could be undermined by asynchronous revisions: the revision cycle for public sector data is typically ahead of the UKEA (Kellaway (2004)).[xxvi]

As a compromise, the following procedure is adopted:

- Before 1987, figures for all public sector transfers (including direct taxes, social contributions and benefits, other current and capital transfers) are taken from the FSBR sources that are notionally consistent with the UKEA. UKEA data are used from 1987.

- Data for taxes and subsidies on production, gross operating surpluses, consumption and non-fixed investment are generally taken from, or aligned, with the UKEA.[xxvii] Exceptionally, figures for fixed capital formation are aligned with FSBR data until 1991, pending the correction of the UKEA. Pre-1955 figures for the gross operating surpluses of the individual public sectors, corrupted in the September 2007 UKEA, are aligned with FSBR data.

- Net lending and other sub-totals are calculated consistently with the chosen component series and therefore may differ from the net lending

figures published in the FSBR public sector accounts or the UKEA. In practice, the historic figures align with the FSBR data.

Some FSBR series that have no exact counterpart in the UKEA have to be used indirectly by deploying sub-totals that should be the same in either source. For example, the FSBR presentation does not have the equivalent of the ESA95 series for central government interest credits and debits but equivalence does hold for a series comprising credits less debits of interest and dividends. Appendix 2 details the derivation of historic data using these sub-totals, which are more reliable than the component series.

5 Balance of payments accounts

Historic data for the Rest of the World sector are incomplete and have sometimes been corrupted.[xxviii] But some reliable long runs are available – for example, for trade balances and total property incomes – and these series can be supplemented with data from the balance of payments accounts. The latter provide long runs of figures for current and capital transfers and a sector breakdown of income from overseas investment.

Although ESA95 consistent, the balance of payments presentation differs from the ESA95 presentation. Property income is differentiated by investment instrument and by the presumed degree of managerial control exercised by the overseas investor. Although there are some similarities, the ESA95 distinction between types of property income cannot be fully recovered from the balance of payments accounts. In addition, balance of payments current transfers include not only the miscellaneous transfers identified in the UKEA accounts but also indirect taxes and subsidies on production, taxes on income, social contributions and social benefits.

Using a modest amount of estimation for earlier figures,[xxix] and the extensive manipulation of intricate identities, it is possible to construct a full history from 1948 of the Rest of the World accounts for each of the major ESA95 expenditure and income categories apart from its division of property income. Data for property income types are only available from 1987. Appendix 3 gives details.

The balance of payments accounts are also sufficiently detailed to enable an identification of income flows between the Rest of the World and public sector. As shown by identities (26) to (30), once the public-Rest of the World inter-sector transfer balances are known, it is possible to infer the full three-way inter-sector matrix of transfer balances.

6 Some results

The main result of this exercise is the resurrected HSNA provided in our freely available online database. Here we summarise key data to illustrate the accounting identities and to make comparisons with the last officially available pre-ESA95 figures given in the 1997 Blue Book.

Using 2007 Blue Book consistent data, Table 2 illustrates the accounting relationships for the private, public and Rest of the World sectors in 1996, the most recent year for which it is possible to compare official data before and after the ESA95 conversion. It may be noted that:

- The sum of sectors' gross value added (£671.5bn), the factor cost adjustment (£97.4bn) and the (zero) residual error is equal to the sum of sectors' expenditure, the expenditure estimate of GDP. In this case, $GDP(E)$ is also equal to the "definitive" (previously referred to as "average") estimate of GDP (£768.9bn).

- The private sector's disposable income (£630.9bn) is equal to the expenditure estimate of GDP (£768.9bn) less the sum of the disposable incomes of the public and the Rest of the World sectors (£135.0bn and £3.0bn) and the (zero) residual error.

- Across the economy, and allowing where necessary for any residual error, net lending and transfer incomes sum to zero.

Table 2: Summary sector accounts, 1996, £bn

£bn	---------- Sectors ----------			Residual	Economy
1996	**Private**	**Public**	**RoW**	**error**	**total**
Financial surplus/Net lending	23.8	-29.3	5.5	0.0	0.0
Expenditure*	607.1	164.3	-2.5		768.9
Disposable income	630.9	135.0	3.0	0.0	768.9
of which:					
Net indirect taxes		94.5	2.9		97.4
GVA	654.0	17.6	-0.1		671.5
Property income	22.8	-22.3	-0.5		0.0
Other transfers**	-45.8	45.2	0.7		0.0

Source: ONS UKEA consistent with 2007 Blue Book. RoW – Rest of the World. Totals subject to rounding error. The 1996 GDP expenditure measure statistical discrepancy was zero and the definitive (previously "average") estimate of GDP was £768.9bn. *consumption and capital expenditures, exports less imports, including inter-sector net acquisitions of "non-produced, non-financial assets" which sum to zero across the economy. ** include capital transfers.

Table 3: Property income balance matrix, 1996, £bn

Net payments	**Each sector's net receipts:**			
by sector:	**(1) Private**	**(2) Public**	**(3) RoW**	**Sum**
(1) Private	0	-18.4	-4.4	-22.8
(2) Public	18.4	0	3.9***	22.3
(3) RoW	4.4	-3.9***	0	0.5
Sum	22.8**	-22.3*	-0.5*	0

Source: ONS data consistent with 2007 Blue Book. RoW – Rest of the World. * from public sector and RoW accounts. ** derived by residual before 1987 and directly from private sector accounts from 1987. *** from balance of payments accounts. The remaining figures in the table are inferred by identity from the column or row sums.

Table 3 illustrates the three-way inter-sector transfer matrix using property income balances in 1996. The total net credits of each sector are shown in the final row and replicate those given in Table 2. The Rest of the World sector had net property income debits of £0.5bn but, according to the balance of payments accounts, received net property income credits of £3.9bn from the public sector. By implication, the Rest of the World net property income debits arising from transactions with the private sector amounted to £4.4bn (row (1), column (3)).

This sum is recorded as a net credit under the private sector column (row (3), column (1)). Since the private sector received total net property income of £22.8bn, by implication it received £18.4bn of this from the public sector (row (2), column (1)). The skew symmetric matrix is completed by the addition of the inter-sector transfers (with appropriate sign) in the public sector column. It may be noted that all intra-sector transfer balances and the across-sectors sum of transfer balances are zero.

We now turn to a comparison with the most recently available pre-ESA95 data shown in the 1997 Blue Book. This comparison is of interest because the ONS has suggested that users might turn to the older data as a way to backfill sector history prior to 1987 (Statistics Commission (2007)). The major difficulty with this suggestion is the discontinuity between the new and old data, a result of extensive changes of definition and concept and of data revisions.

The ESA95 conversion involved significant amendments to sector definitions, especially within the private sector. Partnerships, formerly included within the "personal sector" were reclassified as "quasi-corporations". According to Dolling (1998), this reclassification was the largest single ESA95 change to affect the income measure of GDP. Another example concerns the property income received by life assurance companies and pension funds (LAPF). Previously scored directly to the personal sector, LAPF property income was henceforth attributed in the first instance to insurance corporations and pension funds, a new sub-sector within the financial corporations sector.

Other definitional changes included the reclassification of some taxes on capital or on expenditure as taxes on income. Notable examples were capital gains tax and local authority rates. Previously regarded as a factor income, part of value added, rent was reclassified as property income and confined to rent on land and sub-soil assets.

ESA95 also introduced many conceptual changes. The coverage of fixed capital formation, for example, was widened to include intangible fixed assets, notably

computer software, and a number of additional tangible assets, including spending on military equipment other than weapons. The coverage of inventories (previously referred to as "stocks") was widened to include the work-in-progress of certain service industries.

In addition to changes of definition and concept, at the time of ESA95 conversion the ONS "…took the opportunity to put through extensive long-run revisions..." (Brueton (1998)). Since 1998, regular Blue Book improvements have led to revisions to GDP, its components and sectors' income and spending all the way back to 1948. The 2001 Blue Book revisions were notably large.

As a result, known history today is significantly different from the history portrayed and unchanged in the 1997 Blue Book.

Table 4 compares the three-sector record in 1996 as it appears now with the pre-ESA95 figures. The table records the differences expressed as a per cent of GDP. Notable differences, each equivalent to 1¼ per cent of GDP or more, include substantial downward revisions to the private sector's financial surplus and net property income and to the public sector's consumption and capital expenditure and substantial upward revisions to private expenditure and to the Rest of the World's net property income. GDP itself was revised up by 3½ per cent.

Table 4: Summary accounts: 2007 Blue Book versus 1997 Blue Book, % of GDP

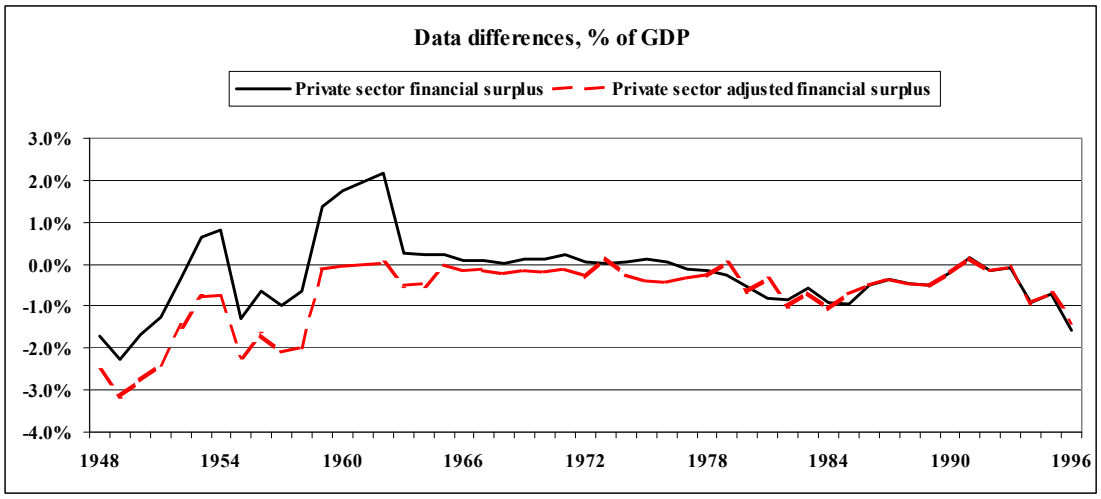
% of GDP	---------- Sectors ----------			Residual	Economy
1996	Private	Public	RoW	Error	total
Financial surplus/Net lending	-1.6	0.7	0.7	0.2	0.0
Expenditure	1.3	-1.6	0.4		0.1
Disposable income	-0.2	-0.9	1.1	0.2	0.1
of which:					
Net indirect taxes		-1.1	0.4		-0.7
GVA	0.2	0.5	0.0		0.6
Property income	-1.5	0.3	1.2		0.0
Other transfers	1.1	-0.5	-0.5		0.0

Source: ONS, author's calculations. RoW – Rest of the World. Totals subject to rounding error. The table shows 2007 Blue Book consistent data minus 1997 Blue Book data expressed as a per cent of the respective levels of "definitive" or "average" GDP.

For selected indicators in the private and market sectors, Charts 1 to 3 show that the differences do not diminish as one reaches further back in time. Differences in the 1950s and 1960s are at least as marked as those in later years. Of the selected indicators, it is noteworthy that the differences are consistently smallest for the market sector's financial surplus adjusted for the national accounts residual error. However, these small differences are the result of large offsetting differences in market sector adjusted disposable income and expenditure (Chart 3).

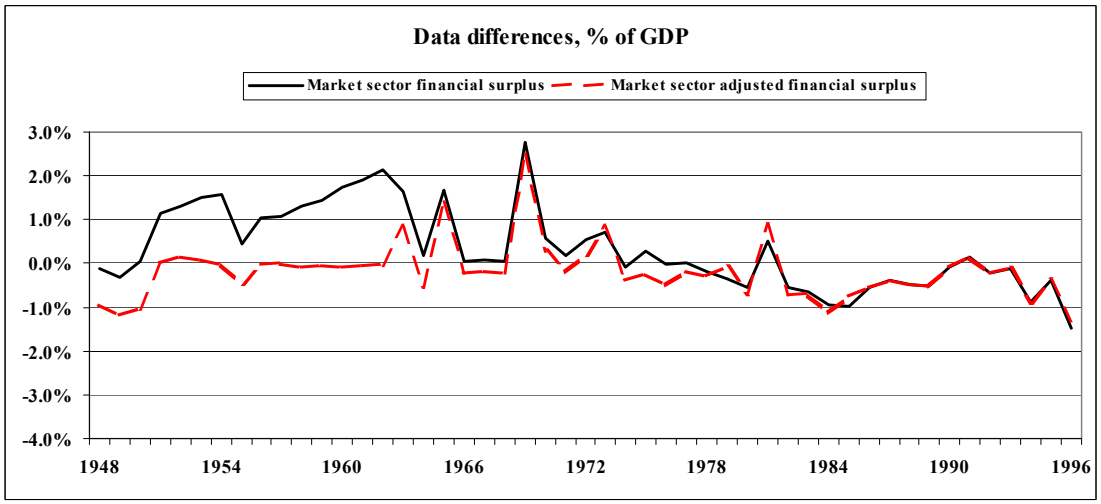
The contention that the 1997 Blue Book data would provide a useful "fall-back" for those wishing to compile a consistent historic sector dataset is substantially rejected by these comparisons. This conclusion is not surprising in view of the methodological changes and data revisions that have occurred since 1998.

Chart 1: Private sector financial surplus, data comparison



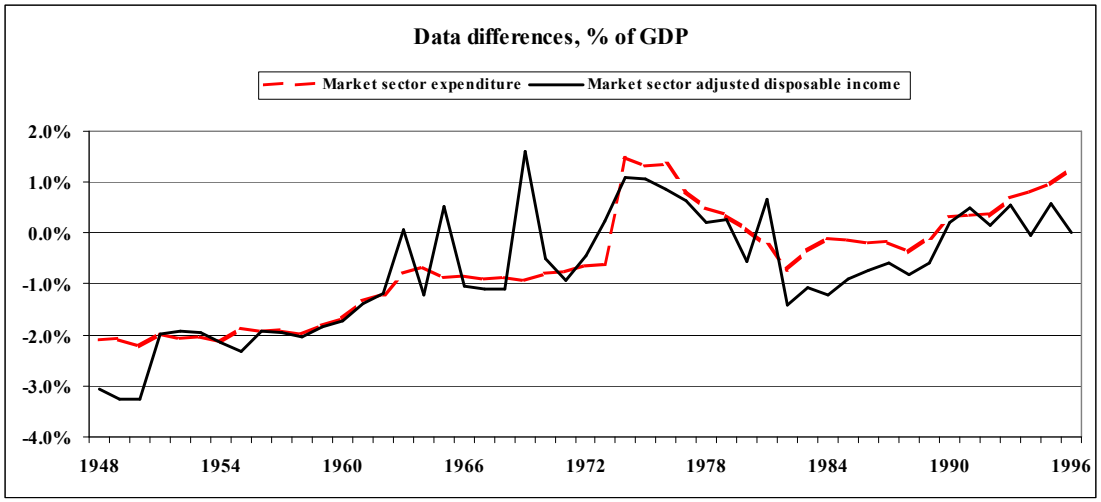
Source: ONS data consistent with 1997 and 2007 Blue Books. Chart shows 2007 Blue Book data minus 1997 Blue Book data.

Chart 2: Market sector financial surplus, data comparison



Source: ONS data consistent with 1997 and 2007 Blue Books. Chart shows 2007 Blue Book data minus 1997 Blue Book data.

Chart 3: Market sector income & spending, data comparison



Source: ONS data consistent with 1997 and 2007 Blue Books. Chart shows 2007 Blue Book data minus 1997 Blue Book data.

7 Conclusion

We have described a method to recover the income and spending flows in the UK's historic sector national accounts before 1987 at a three-sector level of aggregation. The resurrected HSNA, freely available to download, is materially different from the pre-ESA95 data last recorded in the 1997 Blue Book. The latter is generally unsuitable for the purpose of backfilling pre-1987 history, although it is a useful source for hard-to-find individual series.

To our knowledge, our dataset is the only one freely available that provides a basis, albeit an incomplete one, for a serious examination of Britain's post-war macroeconomic history. Coherent financial flow, balance sheet and volume data and further sector disaggregation are required to complete the picture.

Notes

[i] The ONS will operate under the supervision of a new Statistics Board from April 2008.

[ii] ONS (2002) and Statistics Commission (2005) describe the ONS Code of Practice and expected data quality standards.

[iii] http://www.statistics.gov.uk/notices/UKEA-29-june-07.asp; http://www.statistics.gov.uk/notices/UKEA-24-Sep-07.asp.

[iv] The author has recommended that the ONS should perform this role.

[v] In the absence of most of the relevant income components before 1987, the ONS used a spreadsheet to work out the implications for households' disposable incomes of the 1998 ESA95 conversion. Subsequent revisions are similarly handled. The ONS now has no detailed record of this methodology. The disposable income series was afflicted by identity-breaching errors in the 2006 and 2007 Blue Books.

[vi] See Doggett (1998) and Dolling (1998) for a detailed description of the ESA95 and its impact on the UK national accounts. Brueton (1998) and Brueton and Thorp (1998) provide useful summaries.

[vii] The classification of property incomes as transfers payments out of factor incomes is consistent with former UK practice but not with early versions of the UN SNA (Maurice (1968), p2).

[viii] Measured at "factor cost", that is, excluding *all* indirect taxes and subsidies. GVA was previously referred to as the "income measure of GDP". In place of the factor cost adjustment, the ESA95 emphasises the concept of "basic prices" which are struck after the deduction of indirect taxes (and subsidies) that arise specifically on products – like VAT – but not those that arise solely on production – like taxes on property.

[ix] Unless otherwise stated, all references to the "household sector" or "households" should be interpreted to include NPISH.

[x] Golland, Savage, Pike and Knight (1999) give a detailed exposition. HM Treasury (2006) gives updated information.

[xi] Employers' contributions are deducted in the calculation of households' disposable income.

[xii] The ESA95 accounts for financial corporations add back an adjustment for banks' net interest receipts arising from the difference between their lending and deposit rates. These receipts are treated as a payment for Financial Intermediation Services Indirectly Measured (FISIM). Previously called the Financial Services Adjustment, FISIM is the way the ESA95 attempts to square the measurement of banks' activity with the national accounts convention that treats interest payments and receipts as transfers that do not add to GDP. Identity (1) and the sum of mixed incomes and operating surpluses are struck net of FISIM so that the following holds: $GVA \equiv COMP + GOS$.

[xiii] Prior to the ESA95 conversion, Rest of the World compensation of employees was included implicitly within trade in services.

[xiv] Investment spending (I) comprises spending on fixed capital (DK) and inventories (DI) and the net acquisition of valuables (DV). As in the public sector accounts, gross capital

formation (GCF) is defined here as the sum of investment (I) and the net acquisition of non-produced, non-financial assets (DL): $GCF \equiv DK + DI + DV + DL$.

[xv] The definitive (or "average") measure of GDP is connected to the expenditure measure by a statistical discrepancy, a component of the national accounts residual error.

[xvi] A cash transfer is regarded as capital if it is linked to the acquisition or disposal of an asset, other than inventories. All other cash transfers are regarded as current, and directly affect the ESA95 definition of disposable income. In practice, the distinction between capital and current transfers is difficult to draw. Sufficient information is provided in the appended database for those who wish to replicate the ESA95 definition of disposable income.

[xvii] The same results would obviously follow were one to begin with the private sector's financial surplus, derived residually from identity (8), and then separate out the components of disposable income and expenditure.

[xviii] The adjustment for the net equity of households in pension fund reserves arises from the national accounts convention that treats private pension funds as households' property. An excess of households' pension contributions to, over pension payments from, life insurance corporations and pension funds acts first to reduce households' disposable income, but the impact is exactly offset by households' increased net equity in the same funds. It is registered in the financial balance sheet accounts of life insurance corporations and pension funds as an increased financial liability, a technical provision in their reserves to pay future pension benefits to policyholders or beneficiaries. The adjustment for the change in pension fund reserves is equal to the excess of private pension contributions over payments and is added back in the calculation of households' resources.

[xix] Sub-sectors additionally record intra-aggregate sector transfers.

[xx] The problem has been exacerbated by the suspension, on grounds of ESA95 data unreliability, of the publication of the ONS matrix of dividends and interest flows (DIM), which traces such property income flows by sector and by financial instrument. According to Beadle (2007), the ONS "aims to restore the publication of resources and uses (receipts and payments) by instrument by sector in *Blue Book* 2008."

[xxi] The June 2007 UKEA release, which would normally be Blue Book consistent, did not include the impact of the 2007 Blue Book data cull.

[xxii] Financial Statistics tables 2.3D and 2.3F.

[xxiii] Since July 2004, the FSBR series published in Public Sector Finances have used more timely data than are used in the national accounts. This policy explains why data in the public finances release, especially for more recent years, may differ from data published in the latest national accounts. The policy does not excuse the failure to incorporate the FSBR data in the pre-1987 HSNA even at Blue Book time, when the ESA95 accounts are opened up for long-term revision.

[xxiv] The continuing inconsistency of the investment data stems from the failure of the ONS to carry back the reclassification of the Housing Revenue Account from the local government sector to the public corporations sector before 1992. The ONS had planned to fix this error in the 2007 Blue Book.

[xxv] The ONS also corrected data errors that affected such items as taxes and subsidies on production and taxes on capital in the 2006 Blue Book.

[xxvi] Other disadvantages include the lack of seasonally adjusted or chain-linked volume data in the public sector accounts.

[xxvii] General and central government taxes on production are calculated as residuals consistent with the UKEA factor cost adjustment. Pre-1987 FSBR data are used for general government subsidies and local government taxes on production. Central government final consumption expenditure and gross fixed capital formation (GFCF) are calculated as residuals consistent with corresponding UKEA local government and general government figures. UKEA data are used for public corporations GFCF and other items of public sector investment and gross operating surpluses.

[xxviii] In the 2006 Blue Book consistent UKEA release, pre-1987 data for the corrupted Rest of the World net lending series were the same as those recorded as the net lending of public corporations (which, in turn, were inconsistent with FSBR data). The pre-1987 Rest of the World net lending series was culled by the ONS in the March 2007 UKEA release.

[xxix] The partly estimated series are for Rest of the World transactions with the UK National Insurance Fund, total Rest of the World social contributions and public sector overseas investment income credits and debits. The sums involved are typically small. In the case of general government debt interest payments abroad, where the sums are larger, use is made of a pre-ESA95 series before 1984.

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Appendix 1: Variable names

Name	Description
Sector suffixes	
_M	Market sector (households, NPISH and corporate sector)
_V	Private sector
_CG	Central government
_LG	Local government
_GG	General government
_PC	Public corporations
_S	State (public) sector
_W	Rest of the World
_BOP	Balance of Payments
Inter-sector suffixes	
~MW	Market sector – transfer receipts from/transfer payments to Rest of the World
~VW	Private sector – transfer receipts from/transfer payments to Rest of the World)
~CGW	Central government – transfer receipts from/transfer payments to Rest of the World
~LGW	Local government – transfer receipts from/transfer payments to Rest of the World
~GGW	General government – transfer receipts from/transfer payments to Rest of the World
~PCW	Public corporations – transfer receipts from/transfer payments to Rest of the World
~SW	State (public) sector – transfer receipts from/transfer payments to Rest of the World
~WM	Rest of the world – transfer receipts from/transfer payments to Market sector
~WV	Rest of the world – transfer receipts from/transfer payments to Private sector
~WCG	Rest of the world – transfer receipts from/transfer payments to Central government
~WLG	Rest of the world – transfer receipts from/transfer payments to Local government
~WGG	Rest of the world – transfer receipts from/transfer payments to General government
~WPC	Rest of the world – transfer receipts from/transfer payments to Public corporations
~WS	Rest of the world – transfer receipts from/transfer payments to State (public) sector
~MGG	Market sector – transfer receipts from/transfer payments to General government
~GGM	General government - transfer receipts from/transfer payments to Market sector
~VS	Private - transfer receipts from/transfer payments to State (public) sector
~SV	State (public) sector - transfer receipts from/transfer payments to Private sector
Variable names	
CBAL	Current external balance
CDB	Distributed income of corporations balance
CDC	Distributed income received by corporations
CDD	Distributed income paid by corporations
C	Final consumption expenditure
COMP	Compensation of employees
DEP	Depreciation, FSBR definition
DI	Changes in inventories
DIV	Inventories and valuables, FSBR definition.
DKL	Gross capital formation, FSBR definition
DK	Gross fixed capital formation
DLACQ*	Balance of payments acquisitions of non-produced, non-financial assets
DLDIS*	Balance of payments disposals of non-produced, non-financial assets
DL	Acquisitions less disposals of non-produced, non-financial assets
DV	Acquisitions less disposals of valuables
E	Total expenditure (final consumption and gross capital formation)
ECC	Compulsory social contributions, FSBR definition
ERR	National accounts residual error
EUADJD*	Balance of payments current transfers debits central government payments to EU GNP adjustments
EUGNPD*	Balance of payments current transfers debits central government payments to EU GNP 4th resource
FCA	Factor cost adjustment
FIRA*	Balance of payments earnings on reserve assets
FS	Financial surplus or net lending (capital account)
FSX	Financial surplus or net lending (capital account) including national accounts residual error
GCF	Gross capital formation including net acquisitions of non-produced, non-financial assets
GCTB	Current grants (net) within general government, FSBR definition
GCTC	Other current transfers, credits, within general government
GCTD	Other current transfers, debits, within general government
GDPE	Gross domestic product (expenditure measure) at market prices
GDP	Gross domestic product at market prices
GICRB	Interest and dividends (net) from public sector, FSBR definition
GKG	Capital grants (net) within public sector, FSBR definition
GNDI	Gross national disposable income at market prices

Name	Description
GNI	Gross national income at market prices
GOS	Gross operating surplus of corporations and mixed income of households & NPISH
GVA	Gross value added at factor cost
ICRB	Interest and dividend balance from private sector and ROW, FSBR definition
ICRC	Interest and dividend receipts from private sector and ROW, FSBR definition
ICRD	Interest and dividend payments to private sector and ROW, FSBR definition
INTB	Interest income balance
INTC	Interest income
INTD	Interest paid
IPYB	Property income attributable to insurance policy holders balance
IPYC	Property income attributable to insurance policy holders
IPYD	Property income attributable and paid to insurance policy holders
IT	Taxes on production and imports
KCGTRC*	Balance of payments capital transfers credits central government
KCGTRD*	Balance of payments capital transfers debits central government
KGC	Capital grants from private sector, FSBR definition
KGD	Capital grants to private sector, FSBR definition
KOTTRC*	Balance of payments capital transfers credits other sectors
KOTTRD*	Balance of payments capital transfers debits other sectors
KPCDFD*	Balance of payments capital transfers debits public corporations debt forgiveness
KTAX	Taxes on capital
KTDLC*	Balance of payments total capital account credits
KTDLD*	Balance of payments total capital account debits
M	Imports of goods and services
OCTB	Other current transfers balance
OCTC	Other current transfers, credits
OCTD	Other current transfers, debits
OKTB	Miscellaneous capital transfers balance
OKTC	Miscellaneous capital transfers, credits
OKTD	Miscellaneous capital transfers, debits
OTAX	Other current taxes
OTG	Other current grants paid, FSBR definition
OTR	Rent and other current transfers, FSBR definition
PE	Adjustment for the change in net equity of households in pension funds reserves
PIB	Property income balance
PIC	Property income credits total
PID	Property income debits total
RENB	Rent income balance
RENC	Rent income
REND	Rent paid
RFEB	Reinvested earnings received on direct foreign investment balance
RFEC	Reinvested earnings received on direct foreign investment
RFED	Reinvested earnings paid on direct foreign investment
SBB	Social benefits balance
SBF	Net social benefits, FSBR definition
SB	Social benefits, net, other than transfers in kind
SC	Social contributions, net, actual and imputed, of employees, employers and self-employed
SUB	Subsidies on production
TCE	Total current expenditure, FSBR definition
TCR	Total current receipts, FSBR definition
TME	Total managed public expenditure, FSBR definition
TNI	Total net investment, FSBR definition
TRB*	Balance of payments total current transfers balance
TRC*	Balance of payments total current transfers credits
TRD*	Balance of payments total current transfers debits
TRFB	Net current grants paid abroad, FSBR definition
TRFC*	Current international co-operation transfers credits
TRFD*	Current international co-operation transfers debits
TTAX	Total direct taxes
X	Exports of goods and services
YD	Disposable income including net capital transfers
YDX	Disposable income including net capital transfers and national accounts residual error
YTAXC	Rest of the world taxes on income credits
YTAXD	Rest of the world taxes on income debits
YTAX	Current taxes on income
Z	Total transfers including taxes and social benefits

Notes to Appendix 1 table:
Database variable names take the form "name_sector", where "name" is the variable name (omitting the final letter "N" used to denote nominal values); "sector" is the associated sector, as appropriate. "~sector" is used in the case of inter-sector transfers. "_BOP" is used in the case of certain Balance of Payments transfers where sector ownership might otherwise be ambiguous. The associated Rest of the World sector variables have the same name but with sign reversed. The penultimate letters "C", "D" and "B" for grouped series denote respectively Credits, Debits and Balances.
*These series are not included in the historic database accompanying this article.

Appendix 2: ESA95 public sector data

This appendix details the substitutions of FSBR for pre-1987 UKEA data in cases where no directly comparable series exist. ONS Central shared Database Identifiers (CDIDs), the four-digit alphanumeric codes that uniquely identify each ONS series, are not italicised in the identities below to distinguish them from our dataset variable names. The CDIDs cited refer to UKEA data that are assumed to be correct. The superscript "*FS*" is used to denote series that do not appear in the FSBR presentation but are derived using FSBR data. Underscores ("_") are added to the sector suffixes to avoid confusion with inter-sector transfer flows, which are elsewhere denoted by a tilde ("~"). Appendix 1 details series notation.

1 Social contributions and benefits[xxx]

$$SC_{\_CG} \equiv SBB^{\mathrm{FS}}_{\_CG} + \mathrm{NMDR} \qquad \text{(A1)}$$

$$SC_{\_LG} \equiv SBB^{\mathrm{FS}}_{\_LG} + \mathrm{NSMN} \qquad \text{(A2)}$$

2 Rent, other property income and transfers

Central government:

$$OCTC_{\_CG} \equiv OTR_{\_CG} + \mathrm{NMDL} - \mathrm{NMCK} \qquad \text{(A3)}$$

$$OCTD_{\_CG} \equiv OTG_{\_CG} + TRFB_{\_CG} - \mathrm{NMDL} \qquad \text{(A4)}$$

$$GCTD_{\_CG} \equiv GCTB^{FS}_{\_CG} - \text{NMDK}^{\text{xxxi}} \quad \text{(A5)}$$

$$OKTD_{\_CG} \equiv -(\text{NMEN} + \text{NMEO}) \quad \text{(A6)}$$

$$OKTC_{\_CG} \equiv OKTB^{FS}_{\_CG} - OKTD_{\_CG} \quad \text{(A7)}$$

$$INTD_{\_CG} \equiv ICRB^{FS}_{\_CG} - (\text{NMCE} + \text{NMCH}) \quad \text{(A8)}$$

$$TRFD_{\_CG} \equiv TRFB^{FS}_{\_CG} - \text{NMDL}$$

Local government:

$$IPYC_{\_LG} \equiv OTR_{\_LG} - \text{NMKM}^{\text{xxxii}} \quad \text{(A9)}$$

$$OCTD_{\_LG} \equiv OTG_{\_LG} - \text{NMLR}^{\text{xxxiii}} \quad \text{(A10)}$$

$$GCTC_{\_LG} \equiv GCTB^{FS}_{LG} + \text{NMDK} \quad \text{(A11)}$$

$$OKTC_{\_LG} \equiv \text{NMNE} + \text{NMNH} \quad \text{(A12)}$$

$$OKTD_{\_LG} \equiv OKTB^{FS}_{LG} - OKTC_{\_LG} \quad \text{(A13)}$$

$$CDC_{\_LG} \equiv ICRB^{FS}_{\_LG} - (\text{NMKB-NCBW}) \quad \text{(A14)}$$

Public corporations:

$$OCTC_{\_PC} \equiv \text{FDDF} + \text{CY89} \quad \text{(A15)}$$

$$OCTD_{\_PC} \equiv -(\text{FDDM} + \text{CY87}) \quad \text{(A16)}$$

$$OCTB_{\_PC} \equiv OCTC_{\_PC} + OCTD_{\_PC}^{\text{xxxiv}} \quad \text{(A17)}$$

$$REND_{\_PC} \equiv OTR_{\_PC} - OCTB_{\_PC} - \text{FAOT} \quad \text{(A18)}$$

$$OKTD_{\_PC} \equiv OKTB^{FS}_{\_PC} - \text{FDBU} \quad \text{(A19)}$$

$$CDC_{\_PC} \equiv \text{FACT}^{\text{xxxv}} \quad \text{(A20)}$$

$$RFEC_{\_PC} \equiv \text{WUHM}^{\text{xxxvi}} \quad \text{(A21)}$$

$$INTD_{\_PC} \equiv -\text{XAQZ} \quad \text{(A22)}$$

$$CDD_{\_PC} \equiv -\text{ZOYB} \quad \text{(A23)}$$

$$CDB_{\_PC} \equiv CDC_{\_PC} + CDD_{\_PC} \quad \text{(A24)}$$

$$INTC_{\_PC} \equiv ICRB^{FS}_{\_PC} - CDB_{\_PC} - RFEC_{\_PC} - INTD_{\_PC} \quad \text{(A25)}$$

Appendix 3: ESA95 Rest of the World data

The identity for the Rest of the World equivalent to the balance of payments accounts total current transfers balance is:

$$TRB_{\_W} \equiv FCA_{\_W} + YTAX_{\_W} + PE_{\_W} + SBB_{\_W} + OCTB_{\_W} \quad \text{(B1)}$$

Of the right-hand side items, the UKEA provide presumed reliable pre-1987 data for the Rest of the World factor cost adjustment and taxes on income. We proceed by estimating the adjustment for the change in pension fund reserves and the social benefits balance and derive the UKEA series for other current transfers balance by residual.

1 Adjustment for change in pension fund reserves

For the Rest of the World sector, the national accounts adjustment for the change in pension fund reserves comprises the private pension contributions of non-residents working in the UK less private pensions that are paid abroad. The UKEA provide data on this item from 1986.

The amounts involved are small and, from 1987, consistent with the adjustment implied by identities for the current transfers balance of the balance of payments (B1) and the difference between gross national income (GNI) and the gross national disposable income (GNDI):

$$GNDI \equiv GNI - \left(YTAX_{\_W} + SBB_{\_W} + OCTB_{\_W} \right) \quad \text{(B2)}$$

It follows from identities (B1) and (B2) that:

$$PE_{\_W} \equiv TRB_{\_W} - FCA_{\_W} - GNI + GNDI \quad \text{(B3)}$$

Data are available for the right-hand side items in identity (B3) from 1948. Prior to 1987, the implied pension fund reserve adjustment is zero.

2 Social benefits, contributions and other current transfers

The UKEA provide data for Rest of the World social benefits and social contributions from 1986. Our estimation of data for previous years uses the definition of the pension fund reserve adjustment and simple projections of total social contributions and of relevant central government transactions with the Rest of the World. These transactions comprise social contributions paid by non-residents to the UK National Insurance Fund (NIF) and the Fund's payments abroad.

The Rest of the World social benefits balance comprises comparable balances in respect of transactions with the state (here just central government) and with the private sector:

$$SBB_{\_W} \equiv SBB_{\sim WS} + SBB_{\sim WV} \quad \text{(B4)}$$

The pension fund reserve adjustment is defined by:

$$PE_{\_W} \equiv -SBB_{\sim WV} \quad \text{(B5)}$$

It follows that:

$$SBB_{\_W} \equiv SBB_{\sim WS} - PE_{\_W} \quad \text{(B6)}$$

The pension fund reserve adjustment is zero before 1987 implying equality between the overall social benefits balance and the comparable balance arising from transactions between the Rest of the World and the state National Insurance Fund:

$$SBB_{\_W}^{pre-1987} = SBB_{\sim WS} \quad \text{(B7)}$$

Pink Book data for the latter (CDIDs: FJBH and FJCK) are available from 1987. From 1964, comparable pre-ESA95 series come from the 1997 Blue Book (GTKW and HBVJ). NIF payments abroad are scaled to the earliest Pink Book data and, before 1964, held constant as a proportion of total central government social benefit payments. Overseas contributions to the NIF are zero between 1963 and 1976 and are assumed to be zero before 1963.

The pre-1987 estimated Rest of the World state social benefit variables are therefore:

$$SBB_{\sim WS} \equiv ECC_{\sim WS} + SBF_{\sim WS} \quad \text{(B8)}$$

which is equivalent to:

$$SBB_{\sim WCG} \equiv ECC_{\sim WCG} + SBF_{\sim WCG} \quad \text{(B9)}$$

In order to derive the components of the social benefits balance, total social contributions of non-residents working in or for the UK ($SC_{\_W}$) are extrapolated before 1987 in line with their compensation. Rest of the World social benefits are derived consistently using the identity:

$$SB_{\_W} \equiv SBB_{\sim WS} - PE_{\_W} - SC_{\_W} \quad \text{(B10)}$$

The scale of these transactions is small. Any error arising from estimation of pre-1987 data is unlikely to be significant.

Granted the estimates of the social benefits balance, the balance of ESA95 other transfers for the Rest of the World sector before 1987 is derived using a re-arrangement of the balance of payments total transfers balance identity (B1):

$$OCTB_{\_W} \equiv TRB_{\_W} - FCA_{\_W} - YTAX_{\_W} - PE_{\_W} - SBB_{\_W} \quad \text{(B11)}$$

In order to identify Rest of the World transactions with public and private sectors taken separately, Rest of the World transfers credits and debits are required consistent with their balances.

ESA95 Rest of the World **other transfers credits** before 1987 are derived using the following identity:

$$OCTC_{\_W} \equiv -TRD_{\_BOP} - SBF_{\sim WS} - YTAXC_{\_W} - IT_{\_W} + SC_{\_W} - ECC_{\sim WS} \quad \text{(B12)}$$

Apart from our estimates of social contributions and benefits, pre-1987 data are available for each of the right-hand side variables from the UKEA and balance of payments accounts.

The central government component of Rest of the World other current transfers credits is defined by this identity:

$$OCTC_{\sim WCG} \equiv -TRFD_{\_CG} - EUGNPD_{\_BOP} - EUADJD_{\_BOP} \quad \text{(B13)}$$

Central government current transfers payments for international co-operation are derived from the UKEA and from FSBR data for net current grants paid abroad. The two EU balance of payments transactions refer to the UK's GNP-based "4th resource" contributions to the EU budget and associated adjustments. These contributions were introduced as a result of the 1998 reform of EU finances. As a result, ONS data on these items are unaffected by the 1987 cut-off that applies to other detailed balance of payments figures.

There are no transactions with local government, implying:

$$OCTC_{\sim WGG} \equiv OCTC_{\sim WCG} \quad \text{(B14)}$$

Transactions with public corporations are assumed to be zero implying:

$$OCTC_{\sim WS} \equiv OCTC_{\sim WGG} \quad \text{(B15)}$$

The private sector component of Rest of the World other current transfers credits is derived by residual:

$$OCTC_{\sim WV} \equiv OCTC_{\_W} - OCTC_{\sim WS} \quad \text{(B16)}$$

ESA95 Rest of the World **other transfers debits** before 1987 are derived using the identity:

$$OCTD_{\_W} \equiv OCTB_{\_W} + OCTC_{\_W} \quad \text{(B17)}$$

Internal consistency ensures that the following identity is also satisfied:

$$OCTD_{\_W} \equiv -TRC_{\_BOP} - YTAXD_{\_W} - SUB_{\_W} - SC_{\_W} \quad \text{(B18)}$$

The central government component of Rest of the World other current transfers debits is defined by the identity:

$$OCTD_{\sim WCG} \equiv -TRFC_{\_CG} \quad \text{(B19)}$$

Data on central government receipts of current transfers for international co-operation are taken from the UKEA. The same applies for local government receipts.[xxxvii]

It follows that:

$$OCTD_{\sim WGG} \equiv -TRFC_{\_CG} - TRFC_{\_LG} \quad \text{(B20)}$$

Transactions with public corporations are assumed to be zero implying:

$$OCTD_{\sim WS} \equiv OCTD_{\sim WGG} \quad \text{(B21)}$$

The private sector component of Rest of the World other current transfer debits is derived by residual:

$$OCTD_{\sim WV} \equiv OCTD_{\_W} - OCTD_{\sim WS} \quad \text{(B22)}$$ [xxxviii]

3 Taxes on incomes

Details of components and sector attribution of Rest of the World taxes on income are given in the following identities:

$$YTAXC_{\sim WV} \equiv YTAXC_{\_W} \quad \text{(B23)}$$

$$YTAXC_{\sim WS} \equiv 0 \quad \text{(B24)}$$

$$YTAXD_{\sim WCG} \equiv YTAXD_{\_W} \quad \text{(B25)}$$

$$YTAXD_{\sim WS} \equiv YTAXD_{\sim WCG} \quad \text{(B26)}$$

$$YTAXD_{\sim WV} \equiv 0 \quad \text{(B27)}$$

$$YTAX_{\_W} \equiv YTAXC_{\_W} + YTAXD_{\_W} \quad \text{(B28)}$$

$$YTAX_{\_W} \equiv YTAXC_{\sim WV} + YTAXD_{\sim WS} \quad \text{(B29)}$$

4 Miscellaneous capital transfers

Although UKEA data are truncated at 1987, the balance of payments capital account provides an almost complete record of capital transfers and net acquisitions of non-produced, non-financial assets. The following identities apply for balance of payments capital account credits and debits:

$$KTDLC_{\_BOP} \equiv DLDIS_{\_BOP} + OKTC_{\_BOP} \quad \text{(B30)}$$

$$KTDLD_{\_BOP} \equiv DLACQ_{\_BOP} + OKTD_{\_BOP} \quad \text{(B31)}$$

The net acquisition of non-produced, non-financial assets is zero between 1973 and 1995 and is assumed to be zero before 1973. Balance of payments capital transfers debits of central government before 1973 are projected in line with central government miscellaneous capital transfers debits. The amounts involved are small. Balance of payments capital transfer debits arising from public corporation debt forgiveness are zero between 1987 and 1996 and are assumed to be zero before 1987.

Where not available from the UKEA, Rest of the World miscellaneous capital transfers are inferred from their balance of payments capital account counterparts:

$$OKTC_{\sim WCG} \equiv -KCGTRD_{\_BOP} \quad \text{(B32)}$$

$$OKTC_{\sim WPC} \equiv -KPCDFD_{\_BOP} \quad \text{(B33)}$$

$$OKTC_{\sim WV} \equiv -KOTTRD_{\_BOP} + KPCDFD_{\_BOP} \quad \text{(B34)}$$

$$OKTD_{\sim WCG} \equiv -KCGTRC_{\_BOP} \quad \text{(B35)}$$

$$OKTD_{\sim WV} \equiv -KOTTRC_{\_BOP} \quad \text{(B36)}$$

5 Property income

Total Rest of the World property income credits and debits data are available from 1946 but data for the ESA95 components (interest income, corporate distributions, reinvested earnings on foreign direct investment, property income attributed to insurance policy holders) are unavailable (or unreliable) prior to 1987.

The balance of payments data provide a breakdown of total overseas investment income by sector, though the limitations of other overseas investment data prevent a complete attribution of overseas income within the private sector. The most refined division that can be made with available data is between public and private sectors. It is also necessary to estimate earlier data for some public sector components.

Data for central government overseas investment income credits are unavailable prior to 1983. These credits largely comprise earnings on foreign exchange reserves, data for which begin in 1963. These are extrapolated back to 1946 in line with central government total interest receipts. Overseas investment income credits are projected back before 1983 in line with these extended estimates of earnings on reserves.

Data for general government overseas investment income debits are unavailable prior to 1984. Pre-ESA95 UKEA data for a broadly comparable series (CDID: HERS) [xxxix] are available from 1959 and are extrapolated back to 1946 in line with general government interest payments. General government investment income debits are projected back before 1984 in line with these extended pre-ESA95 figures.

The equivalent local government data are available from 1980 and are extrapolated back to 1946 in line with the general government total. The amounts involved are small. Pre-1984 central government data for overseas investment income debits are derived by residual.

Data for public corporations overseas investment income credits and debits are unavailable prior to 1984. Each is projected back in line with the associated property income total. The amounts involved are small.

Appendix footnotes

[xxx] In the 2007 Blue Book consistent UKEA release, data are missing for NMDR and NSMN between 1960 and 1962. Data are taken from the Q4 2005 release for these years.

[xxxi] NMDK is zero.

[xxxii] NMKM is zero.

[xxxiii] Derived using the fact that NMMI=NMLR.

[xxxiv] Available data for CY89 and CY87 are zero before 1997 and are assumed to be zero before 1987. Also FDDF=FDDM=0.

[xxxv] FACT is assumed to be zero before 1984.

[xxxvi] Available data for WUHM are zero before 2001 and are assumed to be zero before 1987.

[xxxvii] The UKEA record local government receipts (routed via central government) from the European Union social fund under the balance of payments current transfer credits of "other sectors" (that is, non-general government sectors) until end 2005. From the September 2007 UKEA release, the receipts after 2005 are recorded under general government other EU balance of payments credits and local government resources from "current international co-operation."

[xxxviii] Note that most UK receipts from the EU Social Fund are attributed to the private sector. In the national accounts, the government is viewed as an agent for the ultimate beneficiary of such transfers.

[xxxix] Under the ESA95-consistent standard set by BPM5, interest on overseas investment income is measured gross of tax. Under the previous standard set by the 4th Edition of the IMF Balance of Payments Manual, interest was recorded net of tax. The 1998 Pink Book shows interest payments in 1987 to overseas investors in British Government stocks that are 46% above the comparable series in the 1997 Pink Book. The same comparison for total general government payments to overseas investors shows an excess of 29%. These differences may be largely due to revisions to post-1986 data. The difference in recorded general government payments is negligible in 1984.