

Historical estimates of financial accounts and balance sheets

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Foreword

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The financial crisis has re-emphasised the importance of tracking the financial transactions of different agents in the economy and how those flows affect their balance sheet positions and the build up of risk in the financial sector. The current financial accounts published by the Office for National Statistics (ONS) only start in 1987 although historical estimates based on earlier systems of national accounts are available back to the 1950s. This article outlines some preliminary work undertaken by the ONS and the Bank of England, with the encouragement and help of external academic consultants¹, to try and reconstruct historical financial accounts and balance sheets by institutional sector for the UK. It sets out the challenges of reconciling accounts from a range of sources, which were produced with different methodologies and classifications, giving some key examples. In addition, [several historical datasets](#) for financial accounts and balance sheets, back to 1920, accompany this publication.

Notes:

1. In particular Anne Harrison, Bill Martin, Avner Offer, Alan Roe, Solomos Solomou and Martin Weale.

1. Introduction – the value of understanding the past

The recent financial crisis has highlighted the importance of monitoring financial transactions between different institutional sectors in the economy and how financial assets and liabilities are distributed across different sectors on their balance sheets. Recently the ONS and the Bank of England published a [review of the existing set of sector financial accounts](#), including some initial estimates of “from whom and to whom” transactions, using data already available in the compilation of the financial accounts. But, as recently highlighted by Bjork and Offer (2013), the analysis of financial transactions in the economy often needs to be put in historical context especially when financial crises are rare events. In particular, econometric-based policy work benefits from the

availability of long time series that span different policy regimes and cover periods of structural change in the financial sector. The current set of published financial accounts and balance sheets began in 1987. Older estimates of the financial accounts are available back to the 1950s, following the recommendations of the Radcliffe Report (1959) and growing interest in modelling the financial interdependence between sectors Roe (1973). Measures of national and personal sector wealth are available for even earlier periods.

The current post-1987 dataset roughly covers a 30-year period when the UK financial sector was largely liberalised and free of direct financial controls following various reforms in the 1970s and 1980s. But the recent introduction of macroprudential policy in the UK and the need to understand how its instruments work has rekindled interest in how the more controlled financial environment of the 1950s and 1960s worked. During this period the authorities operated various policies that, at least superficially, bear some resemblance to the tools at the disposal of today's macroprudential policy makers. The Bank of England's [One Bank Research Agenda](#), suggests there are benefits from understanding the financial system of the 1950s and 1960s as it may shed light on how macroprudential tools might operate. Historical data on financial accounts and balance sheets is a key part of developing that understanding.

Section 2 sets out the historical development of the financial accounts and balance sheets in the UK. In Section 3, the challenges of reconciling a range of historical data sources, produced using different methodologies and classifications are discussed. Section 4 looks at some examples in more detail, and conclusions are presented in the final section.

2. Historical development of the sector financial accounts and balance sheets in the UK

Financial balance sheets and transactions have a long statistical heritage. Copeland (1952) provided the intellectual foundation for the development of flow of funds analysis, publishing an embryonic set of "moneyflow" accounts for the United States. As a result the Federal Reserve began publishing flow of funds¹ accounts in 1955. In the UK, the Radcliffe Report of 1959 set up to investigate the workings of the monetary system, recommended that more data be collected by the Bank of England on the flow of funds in the economy. As a result the Bank of England began publishing flow of funds estimates from September 1963 onwards in its Quarterly Bulletin, and retrospectively published 2 sets of aggregate flow of funds statistics from 1952 to 1970 and 1963 to 1976 respectively. At around the same time as the Radcliffe Report, Professor Jack Revell had begun work on UK balance sheets, the initial results of which were presented in a book the Wealth of the Nation in 1967. This work was later extended by Alan Roe at the Department of Applied Economics in Cambridge, with the support of Jack Revell, the Central Statistics Office (CSO, the forerunner to ONS) and the Bank of England to produce a set of balance sheets between 1956 and 1966. This was published as The Financial Interdependence of the UK economy (1971). From 1977 official flow of funds data were published on a quarterly basis in the CSO's Financial Statistics and provided quarterly estimates back to 1963. Official estimates of sector balance sheets lagged behind financial flows and only became regular outputs in CSO publications in the early 1980s but estimates were constructed back to 1966 to overlap with the estimates of Revell and Roe. In 1997 Solomou and Weale were able to construct estimates of personal sector wealth back from 1920 to 1956, following the earlier interwar estimates of Stamp (1937) and Campion (1929).

The current set of UK financial accounts and balance sheets broken down by institutional sector only begins in 1987. This coincided with the introduction of the European System of Accounts 1995 (ESA95), when a decision was made to limit the historical revisions of the detailed economic accounts, including the financial accounts data, to the minimum legal requirement of 10 years. This decision reflected a number of difficulties in implementing the ESA95 reclassification of different sectors and assets before this point, a difficulty that still remains today. As noted earlier, official estimates based on the pre-ESA95 system of accounts had been available for the financial accounts back to 1963 and balance sheets for some sectors available back to 1966. The introduction of the ESA10 system of accounts in 2014 introduced further changes to financial flows and balance sheets, especially with respect to the treatment of pensions. ONS have detailed these in an [article](#).

The result of these different developments means there is a wealth of information on financial transactions and balance sheets at a sector level that stretches back almost 100 years. However, the different sources are scattered and in need of reconciliation. The remainder of this article discusses some initial first steps towards that reconciliation.

Notes

1. In modern usage the term "flow of funds" is sometimes applied to financial accounts data that include 'from whom-to-whom' statistics. In this article we use the term flow of funds in the older generic sense that covers any data that measure financial transactions between different sectors of the economy.

3. Initial steps towards reconstructing the historical flow of funds data for the UK

As discussed in Bjork and Offer (2013) reconstructing historical flow of funds and balance sheet estimates prior to 1987 involves 2 steps. The first step is collecting and digitising the various vintages of historical data from the range of disparate sources. The second leg is to try and create consistent historical time series from these different sources taking account as far as possible the different classifications of instruments and sectors used in each set of estimates and the different accounting rules applied¹. Alongside this article the Bank and the ONS are publishing historical datasets and documentation that should allow progress on both fronts.

(a) Historical datasets

In addition to this article several published historical datasets on financial accounts and balance sheets have been digitised and made available electronically. For the moment, these datasets contain only annual estimates. Quarterly estimates are available for some sectors but have a more limited back run and a judgement has been made not to publish these data until progress on reconciling the different datasets at an annual level is made. The balance sheet data collected by both the ONS and in the historical datasets also covers non-financial assets such as the physical capital used by corporations and housing as well as financial assets. The focus of this article is on measures of financial assets and liabilities by sector and their relationship with the corresponding financial transaction, although non-financial assets such as housing are touched on later in the article.

Each dataset has been made available on the [ONS website](#) as reference tables, and will be integrated into the Bank of England's [three centuries of macroeconomic data spreadsheet](#). Alongside these datasets, a set of relevant articles and documents have also been provided. Although the data have been subject to a set of rudimentary checks, it is likely that some transcription errors remain and so are being provided on a “best endeavours” basis. Any errors will be corrected in future as work on the data progresses. These data, as they are also in development and not current National Statistics, should be viewed as experimental. A brief description of these datasets is given below. They are ordered chronologically according to the historical period the estimates cover:

1. The first dataset contains the estimates of personal sector² wealth made by Solomou and Weale (1997) for the period 1920 to 1956³. These estimates are based on a number of sources which are described in the article. It contains balance sheet information on both non-financial and financial assets and liabilities.
2. The second dataset contains estimates of the sectoral flow of funds between 1952 and 1970 published by the Bank of England (Bank of England (1972)). The sector breakdown covers the personal sector, industrial and commercial companies, banks, other financial companies, the public sector and the overseas sector⁴. This dataset only covers financial transactions and not balance sheets.
3. The third dataset is the result of pioneering work on UK financial balance sheets carried out in the 1950s and 1960s. As noted earlier, the initial results were presented in a book by Professor Jack Revell entitled *The Wealth of the Nation* in 1967. This work was later extended by Alan Roe at the Department of Applied Economics in Cambridge, with the support of Jack Revell, the CSO and the Bank of England. This was published as the *Financial Interdependence of the UK economy* in 1971. A summary of the data was also provided in an *Economic Trends* article in 1971. The dataset published alongside this article contains the complete set of tables from the *Financial Interdependence of the UK economy* which provided a detailed granular breakdown⁵ of the stocks of financial assets by instrument and by sector between 1957 and 1966⁶. From 1963 data are also provided for transactions in each financial asset by sector, and the revaluation of existing assets in each period due to changes in the market valuation of capital-uncertain assets such as equities and bonds. 2 sets of tables are provided: one showing a breakdown organised by sector and one with a breakdown organised by instrument. Also included is the table from Revell (1967) which has a historical breakdown of total assets and liabilities at a very aggregate level back to 1900.
4. The fourth dataset contains the final vintage of sector financial account and balance sheet estimates produced by the ONS under the pre-ESA 95 system of accounts. This was recovered from the annual UK National Accounts (Blue Book) 1997 dataset and contains data as published in mid-1998, prior to the introduction of the ESA95 set of accounts. But, as discussed in Martin (2009), some series in this dataset may be incomplete and subject to possible error and corruption. The sectoral financial accounts are available between 1963 and 1967 both by sector and instrument. Checks on these data suggest they are largely intact and reliable, although there are some missing elements that need backfilling. For example, the individual transactions in particular assets by sector should in principle sum up to total transactions and this is the case for most sectors and instruments. Balance sheet data by sector are also available for some instruments back to 1966 but in general most items start in 1982 when balance sheet data began to be regularly published in CSO publications. So the recovered dataset is not

complete and, in particular, many balance sheet instruments do not go back far enough to allow an overlap with the Revell and Roe data.

5. For these reasons the pre-ESA 95 dataset is supplemented by other material. Additional information on sectoral balance sheets is available in several ONS publications such as Economic Trends and Financial Statistics articles. Some of that information has also been digitised and put into spreadsheet form. This forms the fifth set of data provided. For example Pettigrew (in an article in Economic Trends November, 1980) outlined the progress made on official estimates balance sheet data following the work of Revell and Roe and provides a useful overlap with their data. Subsequently more detailed data appeared in an article by the Treasury and CSO entitled "Financial wealth of the non-bank private sector" in Economic Trends in July 1981. Excerpts from Financial Statistics covering the period 1976 to 1986 have also been included to cover the overlap with the pre-ESA 95 dataset.
6. The final dataset is the result of an earlier attempt by the ONS and OECD to reconstruct historical financial balance sheets on an ESA95 basis outlined in [Sbano \(2008\)](#). Various assumptions were required to construct these series and only the personal sector balance sheet was constructed before 1979 and with limited data on certain assets and liabilities. However, it does provide a useful crosscheck on efforts to reconstruct the historical data on the current ESA10 dataset.

The first best solution would be to combine this information and produce a fully consistent historical dataset adhering to the current ESA10 standard. That of course would mean reconciling the existing data and mitigating the discrepancies that may exist between the different sector and instrument classifications that have been used in constructing the different historical estimates. It also means incorporating adjustments (where possible) to allow for the fact that the pre-ESA data used a cash recording basis where the ESA data are on an accrual basis. The ONS and Bank of England intend to continue making progress towards this goal, resources and priorities permitting. Some limited first steps towards reconciliation are discussed in the next section. However it is hoped that the publication of these pre-1987 datasets and associated documentation will also enable other users with technical knowledge of financial accounting, balancing techniques, and compilation practices to make their own progress as advocated by Bjork and Offer (2013). This also provides an opportunity for the Bank, the ONS and external users to co-operate towards this goal.

(b) Reconciling the different sources

As noted above, reconciling the different historical sources is a difficult task. The key problem is that adjusting for the various classification differences between sectors and instruments often requires far more information than is typically available from the published historical sources. This is often because the classification differences occur at a relatively disaggregated level compared to the more aggregated data that was published. So, any attempt to correct for these differences requires detailed knowledge of what the classification changes are and how important they were further back in time. This information may not always be available in the published documentation on the sources and methods of a particular series and often requires the knowledge of the experts who constructed the series. Sometimes the conceptual difference may be clear but data sources may not exist.

As an example there are material differences between the current ESA10 official estimates for financial transactions and balance sheets and the pre-ESA95 figures (Dataset 3). In particular there were a number of significant changes affecting allocation across sectors that occurred between

the pre- and post-ESA95 datasets. These include changes both to the definition of the institutional sector, and to the classification of individual entities.

The personal sector in the pre-ESA95 system of accounts included partnerships which under the ESA95 standard were treated as quasi-corporations and moved to the corporate sector. Life assurance and pension funds were also moved from the personal sector to the financial corporations sector. The remaining part of the personal sector was then re-designated the Household sector under ESA95. This has usually been presented together with the sector of non-profit institutions serving households (the 'NPISH' sector, which includes charities, religious institutions and universities), although it is hoped to be able to separate the accounts of the 2 sectors in the future.

Significant reclassifications of individual units occurred when the Bank of England's issue department was moved from central government to the new monetary and financial institutions (MFI) sector; while the Bank of England's banking department was moved from the public corporation sector to the MFI sector.

In terms of the classification of financial instruments, the pre-ESA classification of borrowing by Central Government followed the institutional arrangements used rather than the standard list of instruments used across all sectors under ESA95 and ESA10.

Reconciling these different classification breaks typically means acquiring detailed time series data on the asset and liability breakdown of these institutions stretching back sufficiently far in time.

A further issue is stock-flow consistency between the financial transactions made over a period (which in economic terms would be thought of as the "flow" variable) and financial balance sheets which measure the value of assets held at a particular point in time (the "stock" variable). For each type of asset the change in the value of the stock held over a given period of time should equal the transactions made over the period, which either add to or detract from the stock, plus any revaluations to the existing stock or other "known" changes in volume (for example, write-offs and reclassifications) that have taken place during the period:

- closing stock = opening stock + transactions + revaluations (where applicable) + other changes in volume

For some instruments such as currency, bank deposits, loans and trade credit the revaluation is limited to those that are denominated in foreign currencies. Bonds and equities, however, will vary according to their market price and will be subject to revaluation due to both changes in foreign exchange rates and holding gains or losses. In practice however this identity may not hold because of various measurement issues. For example, there may be separate data sources for stocks, transactions and, in some cases, revaluation effects and other changes in volume. In many cases these published sources might be expected, in theory, to produce identical estimates but for various reasons they disagree. In particular, data on transactions might be collected at a different time or on a different frequency to that on stocks. An article in *Economic Trends* by Marland (1983) discussed various issue of reconciling flows and stocks for the personal sector.

A further problem with the UK data is that the development of balance sheet data in the UK lagged behind that of financial flow of funds and consistency between the 2 improved only gradually over

time. It was not until the early 1980s (see Pettigrew (1980), HM Treasury and Central Statistical Office (1981)) that CSO balance sheets estimates were produced which overlapped with the work of Revell and Roe. And it was not until the mid-1980s that balance sheet data was regularly published in Financial Statistics and the Blue Book on a comprehensive basis alongside financial transactions. Even by the mid-1990s, where the pre ESA-95 dataset ends, there was still not full consistency between stocks and flows as discussed in the Financial Statistics Explanatory Handbooks of the time:

- "Currently the sources and methods used to compile the balance sheet data are under review. The original work⁷ did not attempt to link the balance sheet data to the flows; a different classification system was employed. Now, progressively, the flows and levels data are being reconciled and harmonised. Meanwhile users should be wary of assuming that this comparability between flows and levels exists throughout; it does not."

It is especially unclear how far, and to what extent, successive revisions to the flows and stocks data were carried back in the pre-ESA95 dataset and how consistently this was done. This is not helped by the fact that much of the published balance sheet data was heavily rounded.

The inconsistency between stocks and flows causes difficulty for users especially if they are unsure about the relative quality of the different data sources for stocks and flows. One approach might be to place more weight on the financial transactions data given their longer heritage. Stocks could then be derived by extrapolating backwards from a reliable starting point, using information from share prices and bond prices to revalue assets with a fluctuating market value and applying other known changes in volume due to reclassifications. One could then check whether the resulting values for stocks of assets are within an acceptable margin of the published balance sheet data. However, often the flow is very small relative to the level of the stock and may be more prone to error. An alternative is to calculate the flow from the stock figures (where available) and see whether the difference between estimated and observed flows is a plausible figure for revaluations and other flows.

A more comprehensive technique, originally outlined by van der Ploeg (1982), can be applied which assumes that the discrepancies between changes in stocks and the corresponding flows and revaluations are the result of random measurement errors. The unidentified item is reallocated between the stocks, flows and revaluations, on a "least squares" basis, so that the reconciliation balances exactly. Further refinements of the technique involve additional assumptions about the ratios of the variances of measurement errors in the stocks, transactions, revaluations and other changes in volume. Sefton and Weale (1995) adopted a least squares approach to produce a balanced set of national accounts between 1920 and 1990, although this did not cover the financial accounts. This approach requires considerable expertise and technical knowledge of the data to be carried out effectively. In particular, judgements about the relative reliability of the different sources of data are required.

In practice a reconciliation of the data depends on the needs and requirements of the user and in some cases can be done at a more aggregate level and/or using more approximate methods if the structural breaks in the series are not large. Martin (2009) for example has demonstrated that at a relatively aggregated level, historical sector income and expenditure data can be "backfilled" using available digital resources, though he notes that this procedure still requires detailed accounting

knowledge and an awareness of the possible sources of data corruption. The UK Statistics Commission of 2007 also suggested that a more approximate method of reconstructing historical datasets might be to "reconcile, and link, current ESA95 data with earlier pre ESA95-based series available to 1996". This approach was used, for example, to back-cast financial balance sheets (Sbano (2008)).

Typically researchers use a number of methods to link historical series together. For example, when a researcher is faced with 2 overlapping historical estimates of a single series, a simple method is to link the different chains of data using the ratio of the 2 series at the point (or over the range) where they overlap. This essentially preserves the growth rates of the 2 series before and after the chosen overlap point. This method, although convenient and simple, suffers from 2 weaknesses.

1. First it locks in any level differences between the 2 series. For example if the later historical series is 10% higher than the earlier series, this method locks in that 10% level difference over the entire back run of the earlier series. This implicitly assumes that the factor that caused that 10% difference was of the same magnitude relative to the other components over the whole of the earlier period. But it may be that the relevant factor or factors over this period have varied considerably and the overlap point reflects an unusual peak or trough in the series. The factor may also have been trended over time. As a result the true level difference between the series should be significantly more or less than 10% as one goes further back in time. If there is a sufficiently long overlap between the 2 series this can be used to discern any trend divergence between the series or any obvious peaks and troughs. For example, the pre-ESA95 and ESA10 datasets have a 10-year overlap period of overlap which provides some basis for a backwards extrapolation of many series.
2. Second, application of this method may unwittingly breach important accounting constraints when applied to a group of series that need to satisfy particular identities. This occurs for example, when using this method to link a set of series that add up to an aggregate total. The resulting chained series will not be additive prior to the overlap point and additional adjustments are usually necessary to achieve additivity. This problem applies particularly to the financial accounts and sector balance sheets which must meet a number of such accounting constraints. One alternative is simply to leave an identified break in the series at the overlap so that the additivity within the different chains of data remains. An alternative is to try to find a way to account for the change obtained from the overlap method while preserving the accounting identities perhaps by applying a scaling factor to component series to ensure additivity.

Clearly different users will have different priorities. Some users may just be interested in an aggregate series adjusted for classification breaks – for example net financial assets of the personal sector – in which case the simple overlap method described above may suffice. Other users however, may be interested in a set of series which satisfy an additivity constraint. In this case it may be easier just to leave a break at a common point in the component series especially if the differences between the overlapping series are relatively small and it is not worth breaking additivity constraints. An example of these different approaches can be seen in the Bank of England's [three centuries dataset](#)⁸.

Notes

1. For example the pre-ESA 95 system was on a cash basis, but the current system is accrual based.
2. Their definition includes households, unincorporated businesses, non-profit institutions serving households and life insurance and pension funds.
3. We are grateful to Solomos Solomou, Martin Weale and The Review of Income and Wealth for their kind permission to reproduce these estimates.
4. The definition of sectors in this dataset differs somewhat from that now used both in coverage and terminology. The personal sector covered what is now referred to as the household sector, so included non-profit institution serving households, but also partnerships and life assurance and pension funds. The term “industrial and commercial companies” corresponds closely to private non-financial corporations but excludes partnerships that were previously included in the personal sector. Other financial institutions included building societies, now included with banks in a monetary financial institutions sector. The public sector covered general government and public corporations.
5. Both the sector breakdown and the breakdown of financial instruments are in fact more detailed than the current published set of financial accounts.
6. We are grateful to Professor Alan Roe for his kind permission to reproduce his estimates.
7. This was a reference to Pettigrew (1980).
8. In this dataset the historical chains of data are made available alongside spliced series which in large part use the methods described above. As long as the historical chains of data are made available and the calculations for spliced series are relatively transparent users can choose the method that best meets their needs.

4. An example of the issues: financial accounts and balance sheets for the household and NPISH sector

This section examines some of the issues identified above by looking at the historic data on the financial transactions and balance sheets of the household and NPISH sectors. Currently under the European System of Accounts 2010 (ESA10) system of accounts, the ONS provide financial accounts and balance sheets for the combined household and NPISH sectors¹. Prior to the ESA95 system, which was introduced in 1998, balance sheets were produced for the personal sector which also included partnerships that are now treated as quasi-corporations. This change in definition is one source of difference between current and earlier historical estimates. Another key difference between the pre-ESA95, ESA95 and ESA10 system of accounts is the [treatment and valuation of pensions](#) which also creates breaks in both transactions and balance sheet valuations.

The issues are examined through the use of a number of examples. In the discussion below the term “personal sector” is used generically as a catch all for the different definitions of the personal and household and NPISH sectors in the pre and post-ESA95 systems of accounts.

Example 1: Personal sector net financial wealth 1920 to 2014

Estimates of the net financial wealth of the personal sector can be constructed back over almost 100 years. Figure 1 shows the different historical estimates of net financial wealth that can be constructed from the various sources discussed earlier. Chart 2 shows a spliced measure that uses the overlap method discussed earlier to produce a continuous series over the period 1920 to 2014. We also show the series of Sbrana (2008) who attempted to create a continuous historical series on an earlier ESA95 vintage of data. Several points are worth noting from the charts.

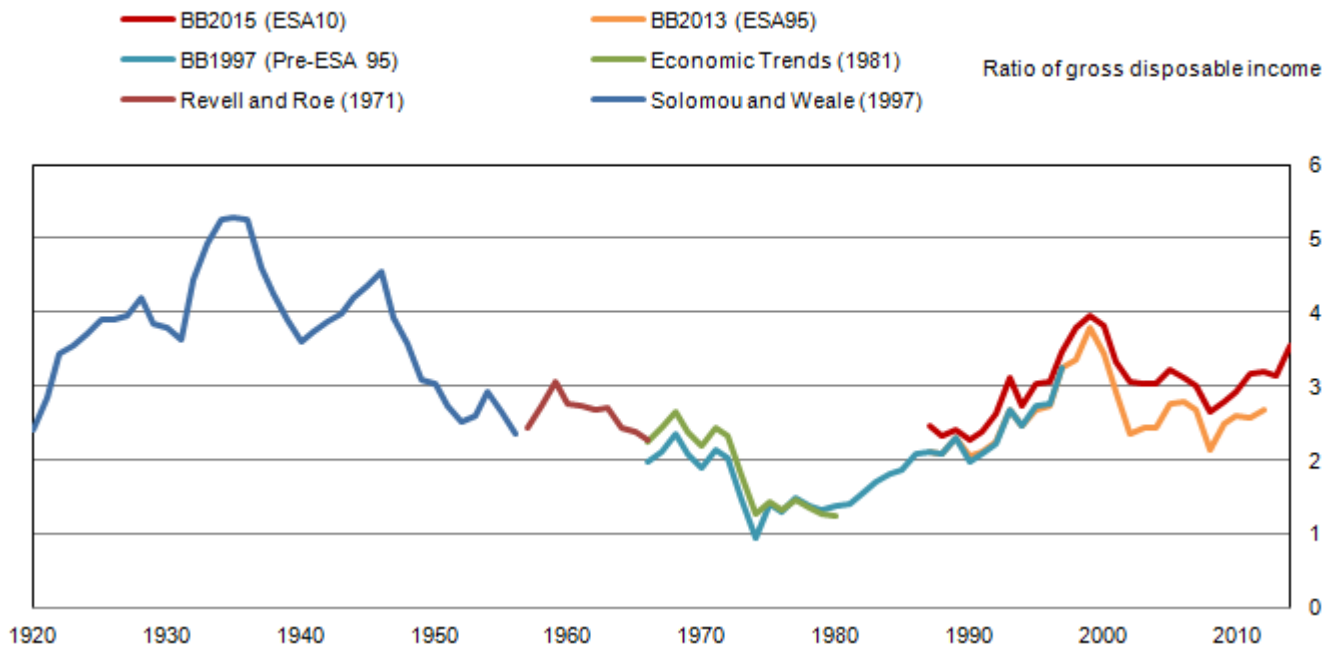
Figure 1 shows that a large break was introduced in the series from the ESA10 revisions in BB2014 when compared with both the ESA95 and pre-ESA95 measures. This is mainly due to conceptual improvements to the estimation of defined benefit pension schemes in ESA10 whereby the value of pensions are now represented by the liabilities to future pensioners rather than the value of the assets held by pension funds. Given the incidence of under-funded and unfunded schemes, this leads to significant increases in household assets and pension fund liabilities. Prior to those revisions the measure of net financial wealth for the personal sector pre and post-ESA95 were very similar.

A further break occurs in the late 1960s between the estimates of the pre-ESA95 Blue Book dataset and the earlier estimates of Revell and Roe (1971), which were very similar to the official estimates that appeared later in Economic Trends (1981). In the absence of detailed knowledge of how revisions to the historical data were applied to the pre-ESA95 dataset, a judgement needs to be made about how to deal with this break. For example, Sbrana’s (2008) spliced measure in Figure 2 does not appear to be based on the pre-ESA 95 observations prior to 1975 and are closer to those that appeared in Economic Trends (1981).

Overall however, the charts appear to show that at an aggregate level, and when expressed as a ratio of gross disposable household income, the breaks in the personal sector wealth series across the different historical estimates appear relatively small compared to the overall movements in the series. So the choice of how to splice the different components together is unlikely to distort the overall pattern of the resulting series for household sector net financial wealth. It suggests that for simple aggregated measures simple methods of extrapolating historical estimates may be acceptable.

Figure 2 shows a spliced measure of net financial wealth across the different vintages of data based on the overlap method discussed earlier. Sbrana’s (2008) spliced estimate based on the ESA95 dataset is also shown. Surprisingly both estimates suggest that the net financial wealth of the personal/household sector is lower as a proportion of income now than at the height of the Great Depression in the 1930s. That largely reflects the increasing importance of housing wealth in overall household sector wealth, some estimates of which are shown in Figure 3. To the extent that the expansion of housing sector wealth has been financed by an increase in mortgage debt that, all other things being equal, has naturally pushed down on net financial wealth.

Figure 1: Estimates of personal sector net financial wealth 1920 to 2014, UK



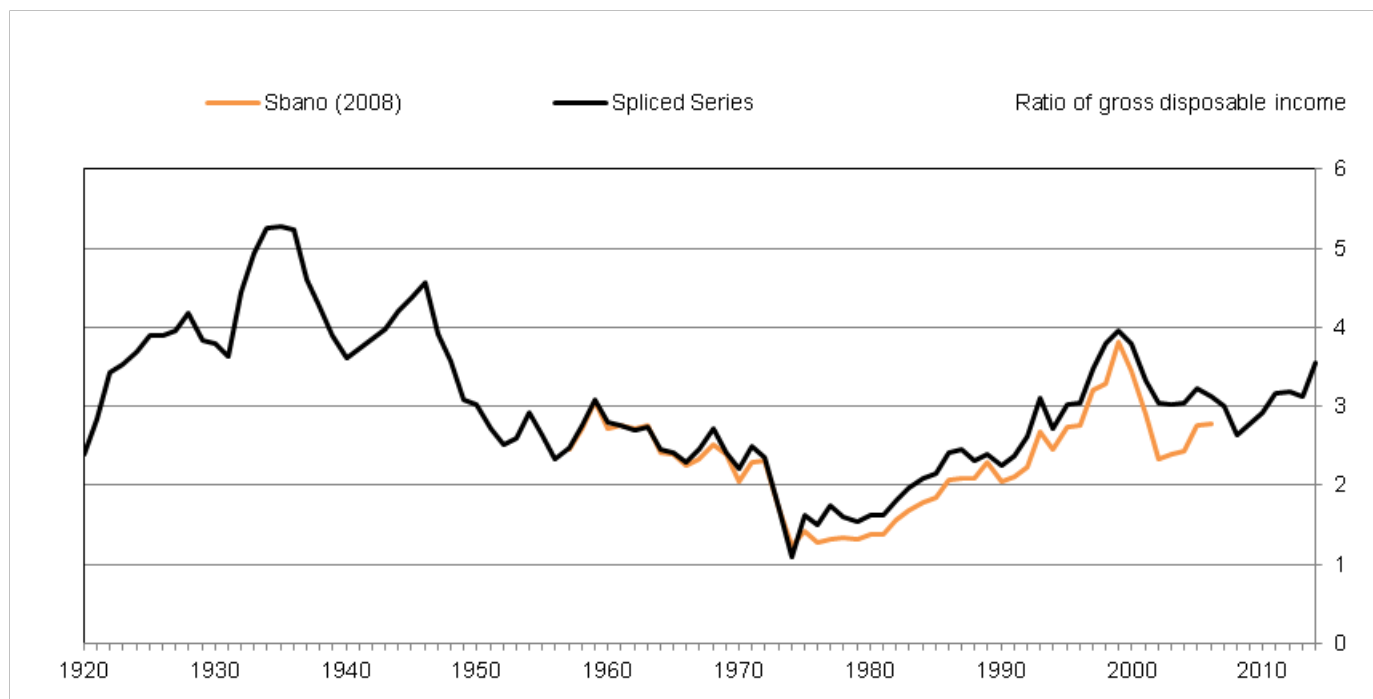
Notes:

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Figure 2: Spliced estimates of personal sector net financial wealth 1920 to 2014, UK



Notes:

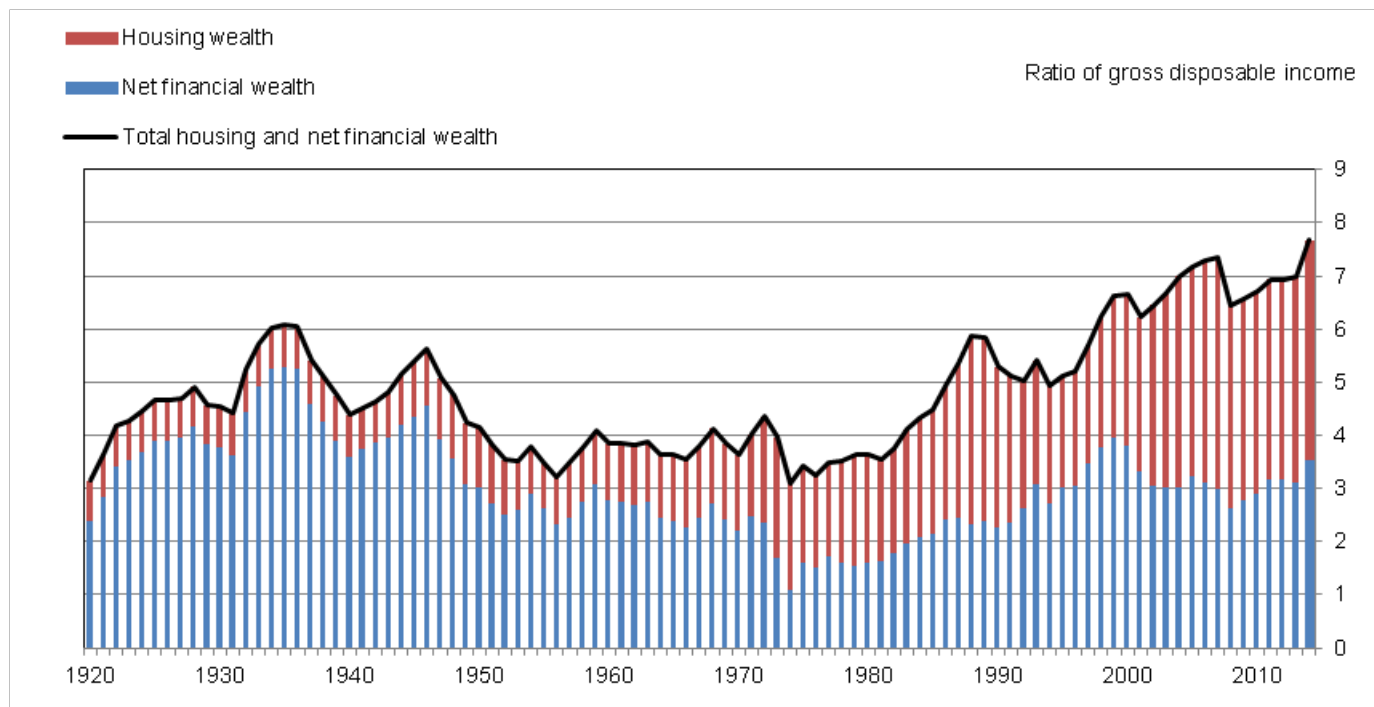
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Figure 3: Personal sector net financial and housing wealth 1920 to 2014, UK

**Notes:**

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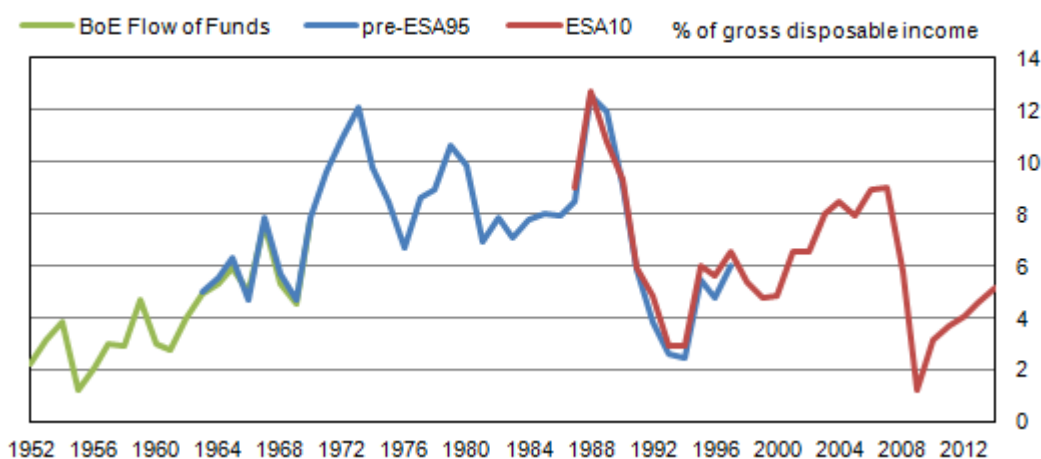
Example 2: Financial transactions of the personal sector by instrument.

Although simple extrapolative methods may work at an aggregate level they may not be appropriate at a disaggregated level. Indeed the aggregate approach might be improved by making better informed extrapolative judgements on the series at a disaggregated level and adding these up to get the aggregate series. To demonstrate this, Figures 4 to 7 show the financial transactions of the personal sector between 1952 and 2014 across the different historical sources, broken down into different instruments. For each vintage of data the financial instruments have been grouped into broad classes using a crude mapping between the different classifications of instruments. Figures 4 to 7 show the net accumulation of 4 ESA10 groupings of assets: cash and deposits, loans (borrowing), shares and other equity (such as unit trusts), and accumulation of assets in insurance companies and pension funds. Each figure shows a comparison of the data from the Bank of

England flow of funds data 1952 to 1970, the pre-ESA95 financial accounts, and the ESA10 financial accounts.

The figures again show that for many instruments, the breaks in the data are not very large. The acquisition of cash and deposits, shares and other equity, and borrowing liabilities are very similar across all 3 vintages of data. This suggests that for these asset classes, it would be possible to join up the flow series (with later vintages overlaying earlier vintages) without the need for any scaling.

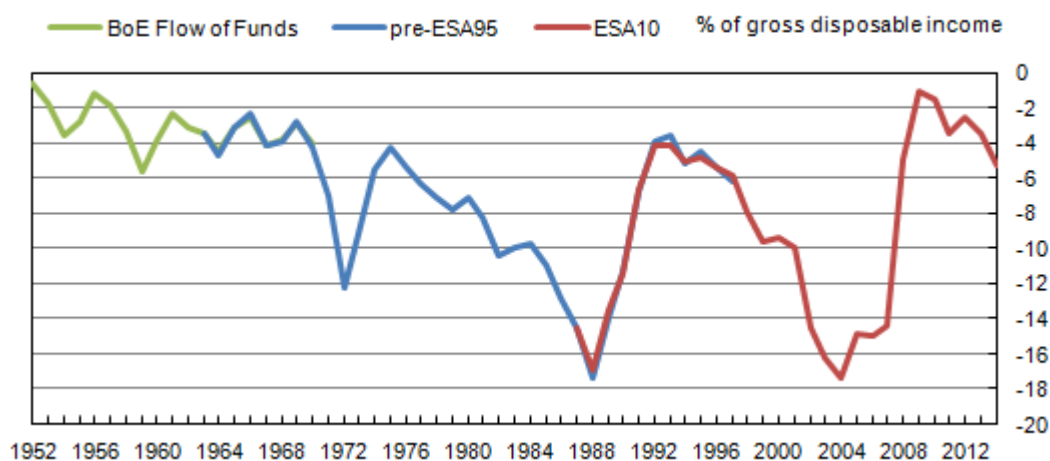
Figure 4: Personal sector acquisition of currency and deposits 1952 to 2014, UK



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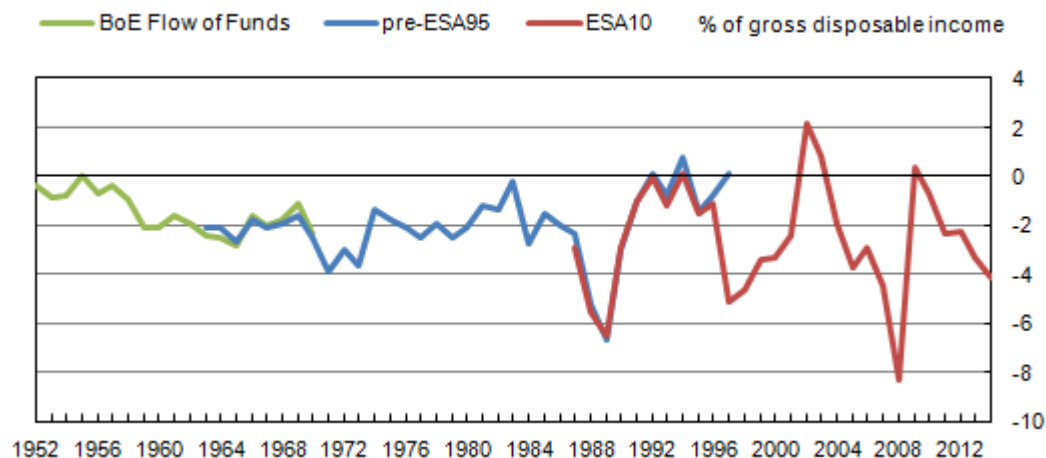
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Figure 5: Personal sector net acquisition of loans 1952 to 2014, UK

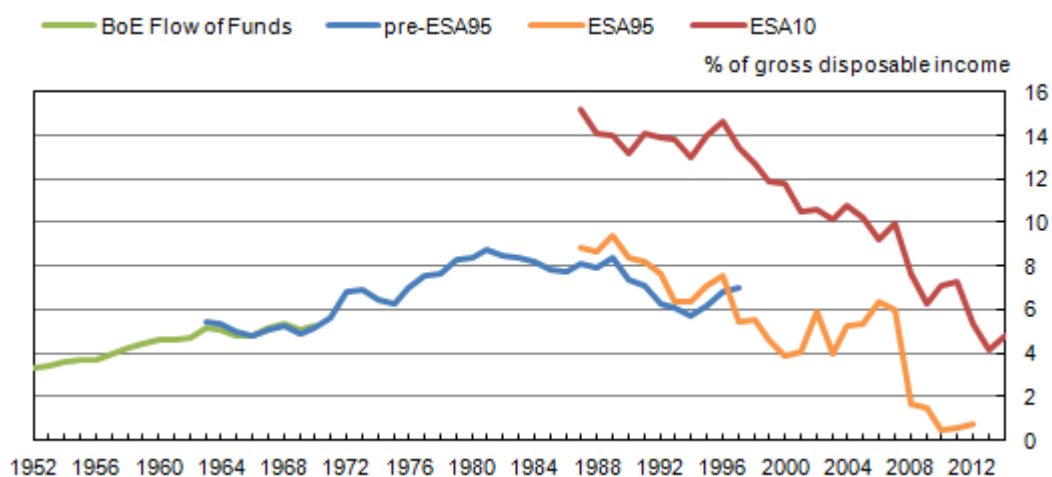


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Figure 6: Personal sector acquisition of shares and other equity 1952 to 2014, UK**Download chart**

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Figure 7: Personal sector acquisition of life assurance and pension fund claims 1952 to 2014, UK**Download chart**

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This is not true however of the acquisition of insurance company and pension fund assets. Again this is largely the result of ESA10 revisions where the measurement of the acquisition of pension fund assets for defined benefit schemes has been conceptually improved. Figure 7 shows that the change from ESA95 to ESA10 leads to a major break in the series of around 6% of disposable income. The pre-ESA95 to ESA95 changes implied a much smaller break. Extrapolating the new ESA10 series backwards in time would require additional information particularly on the

level of assets and liabilities of defined benefit pension schemes over time which may not be readily available. The overlap between the ESA95 and ESA10 series suggests the gap is roughly stationary at around 6% which might suggest making a simple adjustment worth 6% of disposable income over the back run of the series. But the validity of that would depend on the relative importance of contributions to defined benefit schemes relative to other schemes remaining relatively constant. Similarly, any adjustment to the flow would also imply adjustment to the stock of assets held in pension funds. So both adjustment to the flow and stock would need to be considered together for full stock-flow consistency.

Example 3: Financial stock-flow consistency

In this example the issue of stock-flow consistency in the estimates are considered further. As noted earlier, the development of official balance sheet data lagged behind that of data on transactions, and was initially carried out on a different basis. That raises the issue of how consistent the transactions and stocks data in the pre-ESA95 dataset are, especially in terms of how far back data revisions were typically cast backwards in time. For example a revision to the transactions data should imply a corresponding change to the stock data. But it is not always clear how far back consistent revisions were made to the stock data or whether breaks were left in. The issue can be seen in a simple example for personal sector notes and coin where the relationship between stocks and transactions should be straightforward as there are no revaluation effects to consider nor should there be material "other changes in volume".

Table 1 shows personal sector holdings of notes and coin between 1952 and 1997. The first 2 columns show the "flow" or transactions data between 1952 and 1997 from the Bank of England Flow of Funds data and pre-ESA95 datasets. The third column shows the stock series from the pre-ESA95 dataset. The fourth and fifth columns then show the transactions data implied by the change in the stock series, and the difference between that and the published flow data. Between 1988 and 1997 in the pre-ESA dataset the flows and stocks appear consistent with only small difference between published flow series and that derived from looking at the change in the stock. Prior to this point the 2 series diverge suggesting that the 2 series were never reconciled fully over this period or that revisions to the data over time were not taken back in a consistent way.

Closer investigation² suggests this is likely to reflect the changing rule applied to the allocation of notes and coin between the personal and the industrial and commercial company sectors. The aggregate holdings of notes and coin and the amount held by financial companies (largely bank till money) and issued by the public sector could be estimated directly from various official sources. The remaining holdings had to be split between the personal and the industrial and commercial company sectors by assumption. The rule that was applied varied over time. Before 1963 it was assumed to be 50/50³. It then changed over time and eventually came to rest at 90/10 in favour of the personal sector. The stock figures appear consistent with the 90/10 rule applied throughout the whole of the back run of the series whereas the flow data appear to be consistent with the allocation rule that was applied at the time. Appropriate reconciliation therefore requires a consistent rule be applied to both stocks and flows. This example demonstrates that specialist knowledge of the detailed judgements involved in constructing both the stocks and flows data, and how consistently a change in judgement was applied historically, is necessary for a full reconciliation of the different sources.

Table 1: Personal sector notes and coin 1952 to 1997, £ million

	BoE flow of funds	pre-ESA 95 flows	pre-ESA 95 Stock	pre-ESA 95 flow derived from stock	Difference between actual and derived stock
1952	36	36			
1953	55	55			
1954	64	64			
1955	48	48			
1956	37	37			
1957	27	27			
1958	25	25			
1959	67	67			
1960	51	51			
1961	49	49			
1962	3	3			
1963	41	60	1977		
1964	71	117	2153	176	-59
1965	137	235	2315	162	73
1966	144	55	2222	-93	148
1967	62	105	2321	99	6
1968	-89	18	2352	31	-13
1969	73	115	2464	112	3
1970	115	139	2722	258	-119
1971		380	2940	218	162
1972		404	3335	395	9
1973		213	3569	234	-21
1974		582	4141	572	10
1975		661	4795	654	7
1976		645	5433	638	7
1977		855	6250	817	38
1978		962	7175	925	37
1979		572	7717	542	30
1980		624	8309	592	32

	BoE flow of funds	pre-ESA 95 flows	pre-ESA 95 Stock	pre-ESA 95 flow derived from stock	Difference between actual and derived stock
1981		439	8845	536	-97
1982		368	8733	-112	480
1983		559	9182	449	110
1984		266	9946	764	-498
1985		449	10373	427	22
1986		676	11437	1064	-388
1987		662	11966	529	133
1988		950	12917	951	-1
1989		819	13736	819	0
1990		-136	13599	-137	1
1991		392	13991	392	0
1992		1002	14988	997	5
1993		930	15912	924	6
1994		1070	16983	1071	-1
1995		1134	18125	1142	-8
1996		766	18891	766	0

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Notes

1. Work is in progress to split out the contribution of the NPISH sector.
2. We are grateful to Anne Harrison for this analysis.
3. Although an additional special day-of-week adjustment was applied to the end of each period to reflect the fact that the amount of notes and coin held by industrial and commercial companies was usually higher on Thursdays and Fridays than at the beginning of the week.

Conclusion

This article has outlined some initial steps to try and reconstruct historical sector financial accounts and balance sheets for the UK prior to 1987. The publication of historical datasets and

associated documentation will hopefully allow users to be able to construct their own historical estimates based on their own requirements. The article has outlined some of the issues to consider when trying to reconstruct historical series at different levels of aggregation but is by no means exhaustive. In the future the ONS and Bank of England hope, resources permitting, to make further progress on reconciling the historical datasets which may allow the publication of continuous historical time series. The previous work by Sbrana (2008), Martin (2009) and Bjork and Offer (2013) have shown possible ways through which this can be achieved. This also provides an opportunity for the Bank, the ONS and external users to co-operate towards this goal. In this regard feedback from users on the usefulness would be welcome. Feedback can be sent to FlowofFundsDevelopment@ons.gsi.gov.uk or Ryland.Thomas@bankofengland.gsi.gov.uk.

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Background notes

1. Details of the policy governing the release of new data are available by visiting www.statisticsauthority.gov.uk/assessment/code-of-practice/index.html or from the Media Relations Office email: media.relations@ons.gsi.gov.uk

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