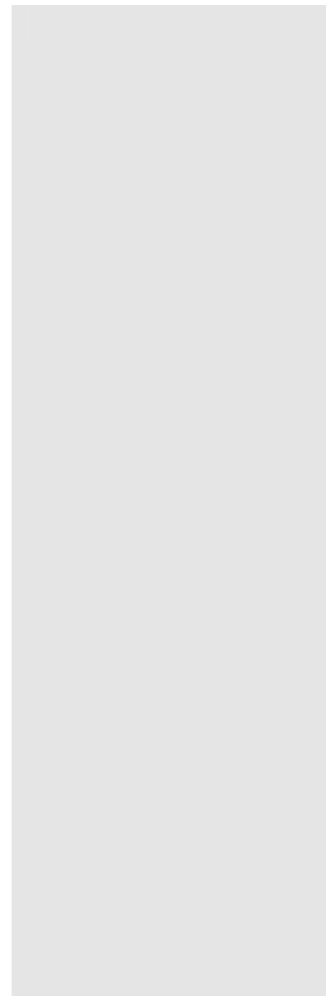


**A QUARTERLY
EXPENDITURE
MEASURE OF GDP
FOR SCOTLAND**



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EXECUTIVE SUMMARY

1. Commentary on the Scottish economy is frequently accompanied by commentary on the quality and availability of economic statistics in Scotland. The macroeconomic story for Scotland is often littered with footnotes on the accuracy and timeliness of indicators measuring economic growth, government spending and investment. Such commentary is useful in continuing to assess the quality and relevance of economic statistics produced by the Scottish Government.
2. However, this debate often overlooks that Scotland is relatively well served in the production of economic statistics. To the best of our knowledge, Scotland is unrivalled among European regions with a timely quarterly official measure of real economic growth. The only significant drawback of the current series is the focus on an output approach across industrial sectors.
3. In the spirit of telling a fuller macroeconomic story for Scotland, the Scottish Government commissioned DTZ to investigate the potential for producing a quarterly measure of Gross Domestic Product (GDP) using an expenditure approach. Instead of focusing on industrial sectors, the expenditure approach focuses on key components of demand covering consumer spending, tourism, investment, government spending and the balance of trade.
4. An expenditure measure of GDP would expand our insight into the economy showing, for example, how business cycles and interest rates influence consumer spending and investment in Scotland. The three approaches to measuring GDP (output, income and expenditure) have traditionally been used to triangulate the position of economies and more quickly identify any issues over quality. A new measure of GDP may therefore also improve the accuracy of other economic statistics.
5. Our investigation has shown that an expenditure approach measure of GDP is both possible and would meet international standards set by the International Monetary Fund (IMF). Most importantly, the new GDP measure could be piloted based on a wealth of existing data and without the need for significant additional resources.
6. A clear path was revealed when the study reviewed what data is available for Scotland's economy and asked a number of fundamental questions. Should the new series show current or constant prices? Should the new series show monetary values or an index? Should the new series be independent, integrated or benchmarked with the existing quarterly GDP series?
7. At the outset of this investigation we established the principle of making best use of Scottish data, to reflect real (observed) characteristics of Scotland's economy. Following this principle, it was evident early on in our investigation that a current price measure of GDP for Scotland was unlikely. There is a dearth of information relating to prices for a range of goods and services in Scotland. These prices would be needed to form a Paasche Price Index in order to construct a current price series of GDP.

8. By contrast, the requirements for a constant price expenditure series of GDP are:
- A reliable base year value measure of GDP including all expenditure components of consumer spending, tourism, investment, government spending and the balance of trade; and
 - A volume or quantity index of expenditure components from the base year to the current year.
9. Perhaps surprisingly, Scotland has both of the ingredients required for a constant price measure of GDP using the expenditure approach. A detailed measure of base year expenditure components of GDP is available through the Scottish Input-Output accounts giving base year weights.
10. A good quality base year is vital and the weights for the existing output approach GDP series are already derived from the Input-Output accounts. However, expenditure and output weights will be different and so meet the IMF requirement for independence of the two series. Accuracy in the base year weights is of equal importance as accuracy in the quarterly volume index for both expenditure and output approaches.
11. A volume or quantity index of expenditure components was also found to be available following a review of existing data. Each expenditure component contains a large number of goods and services. For example, consumer spending covers from petrol to pubs and telephone bills to train tickets. However, we found that a small number of goods and services account for the majority of each component and that reasonable proxies could be applied to the remaining expenditure.
12. For example, construction accounts for over two thirds of investment in Scotland. When software, hardware, commercial vehicles, plant and equipment are added over 80% of investment in Scotland can be accounted for. This invites a simple but elegant approach in using volume indicators of aforementioned goods (weighted to the base year) to show investment. Data is readily available for housing starts, building activity and commercial vehicle registrations.
13. This approach is not ground breaking and is common practice among both developed and developing countries. Statistics New Zealand and Ireland's Central Statistics Office use quarterly indicators of building activity and vehicle registrations to measure the level and growth of the investment component of GDP. The greatest challenge for Scotland, as with other countries, lies in measuring the balance of trade (imports and exports), but constant price Scottish export data are already produced on a regular basis.
14. There are similar volume indicators for other components of expenditure. Government spending volume indicators covering education, health and social work are readily available from the existing GDP series based on the output approach. These indicators will actually be better suited in an expenditure approach measure of GDP and it is likely they will be improved further still as the Atkinson Review is implemented.

15. Constant price GDP series are desirable as they reveal real, rather than nominal, economic trends and are more likely to help inform policy objectives and broader understanding of Scotland's economy. Additionally, the series makes use of observed Scottish data and can be updated as further data is developed or identified.

16. Our investigation also considered whether the Scottish Government could publish a quarterly expenditure approach GDP series as a National Statistics publication meeting internationally recognised guidelines. The International Monetary Fund (IMF) outlines the following guidelines for the production of quarterly national accounts:

- They should be built on accurate and timely data - indirect and econometric (estimation) techniques are not substitutes;
- Quarterly national accounts should be consistent with accompanying annual accounts;
- Revisions are necessary and should be made in a transparent manner;
- Quarterly national accounts should form a consistent time series;
- Individual components are important and must be reliable; and
- Unadjusted data should be the foundation for quarterly national accounts though subsequent adjustments, such as accounting for seasonality, may be desirable.

17. Our suggested framework for measuring expenditure approach GDP meets all of the international guidelines outlined above. Given the appetite for improving Scotland's economic statistics, there is considerable merit in taking forward the series using the framework outlined in this report.

18. Commentary on any new series is likely to concentrate on outcomes rather than acknowledge its infancy and future development. Although this report has outlined a positive way forward, the first steps should be taken with caution, perhaps with an initial in-house pilot series.

19. Economic statistics are used more frequently in Scotland and commentators make best use of what is available. Tourism figures are cited more frequently reflecting its importance to the Scottish economy. Commentators tend to quote Gross Value Added rather than Gross Domestic Product reflecting the relative availability of the two measures.

20. In summary, with support from Scottish Government economists and statisticians, our report has outlined a cost effective way to address a missing chapter in the macroeconomic story for Scotland. The new series will meet international publication standards and may help improve the accuracy of a range of existing economic statistics.

CHAPTER ONE INTRODUCTION

1.1 Growing Gross Domestic Product (GDP) is a priority for the new Parliament, with aspirations for a specific GDP target to equal UK growth. GDP can be calculated in a three ways and the Scottish Government publishes a quarterly output measure of GDP. The output measure allows the performance of industries, and their influence on overall economic growth, to be tracked and assessed. Scotland's existing output measure of GDP has received much attention in the media, offering detailed industry analysis.

1.2 To develop a fuller understanding of how the economy operates there is a need to triangulate different GDP measures looking at the key components in the economy - income, output and expenditure. A measure of GDP (E) would add a new dimension to the existing analysis: regular messages for final demand markets.

1.3 The Scottish Government produces annual Input-Output tables providing a snapshot of the three measures of GDP at current prices. However, the Input-Output tables are only available with a lag of around 3 years and are currently not able to form consistent time-series.

1.4 Against this background the Scottish Government would like to examine the potential for the future production of a quarterly GDP expenditure measure in order to supplement their understanding of trends in industrial sectors with trends in final demand expenditure patterns. Furthermore, the additional GDP expenditure measure may lead to a more timely and complete picture of Scotland's economy.

1.5 This report is a scoping study into the future production of a quarterly expenditure measure of GDP for Scotland – GDP (E). The Office of the Chief Economic Adviser (OCEA) and the Department of Enterprise, Transport and Lifelong Learning (ETLLD) commissioned DTZ to establish data requirements, the current availability of data and to specify additional data collection activities (if required).

Uses and aspirations

1.6 There is low coverage for GDP (E) at present because not much information is available to provide up-to-date messages on final markets. GDP (E) uses should become more apparent once up-to-date final demand analysis is available to inform spending reviews. However, anticipated uses are threefold:

1. GDP (E) is a fundamental building block for understanding the economy and a current gap in available information.
2. To boost the credibility of Scottish economic statistics, offering greater depth for analysis.
3. To provide a comparative point of view with the UK, aimed at measuring performance against any explicit targets for raising the sustainable growth rate.

1.7 The key benefit in moving towards a quarterly expenditure measure of GDP is that a fuller macroeconomic picture can be measured and interpreted. Currently, commentary on the Scottish economy is largely limited to sector trends and dated interpretation of final demand markets from Input-Output tables. This is a less than ideal situation with government economists trying to assess fundamental macroeconomic policies without the benefit of data on aggregate demand markets. However, this benefit could, and should, extend well beyond government economists.

1.8 For example, high street retailers, house builders and banks are likely to be interested in household expenditure trends and VisitScotland are likely to be very interested in tourism markets. Wider interest in an expenditure measure of GDP would be worthwhile considering in helping inform whether incremental resources provide value for money. Indeed, the ONS assess where to target incremental resources for the UK national accounts according to *relevance* and *accessibility and clarity*.

Approach

1.9 This study outlines the data requirements and appropriate methodologies to use whilst remaining compliant with the European System of Accounts 1995. Data should also allow the Scottish Government to measure individual final demand sectors such as household expenditure or investment and allow for comparisons between Scotland, the UK and other countries.

1.10 Consideration is currently being given to data that are already readily available and the costs of developing additional data including ongoing costs, frequency and method of data collection. The relevant development options are being assessed in order to inform how robust various measures of GDP could be relative to the cost of generating additional data.

1.11 The study also explores the potential relationship between a newly generated GDP expenditure measure and other National Statistics publications produced by the Government. This includes the GDP output measure, Input-Output tables and Government Expenditure and Revenue in Scotland (GERS).

1.12 The technical aspects of this study have been led by Emeritus Professor Iain McNicoll, who has over 30 years experience in modelling the Scottish Economy and in the development and application of Input-Output tables for regional and national economies across the world. His extensive international portfolio includes projects undertaken for the World Bank, Overseas Development Agency, United Nations Development Programme and others.

CHAPTER TWO IDENTIFYING BEST PRACTICE

Fundamental guidelines

2.1 The IMF *Quarterly National Accounts manual* lists the following as being key desirable attributes of any set of “official” quarterly national accounts statistics:

1. QNA statistics should be built on accurate and timely *data*. “Indirect” and econometric techniques are not substitutes;
2. QNA statistics should be consistent with annual equivalents;
3. Revisions to QNA series will generally be necessary and should be made in a transparent manner;
4. QNA statistics should be presented as consistent time series;
5. In terms of specific QNA series, GDP is important, but so are sub-components of GDP and other elements of national accounts as given in the SNA; and
6. *Unadjusted* data “should be the foundation of national accounts compilation”. For the QNA, unadjusted quarterly series are the first and primary requirement, though *subsequent* adjustments for seasonality, benchmarking, etc may be desirable.

2.2 Any QNA series which exhibits the above characteristics will also conform to the requirements of the SNA and ESA (95). Hence, points (1)-(6) provides a general set of fundamental guidelines which should inform proposals for the compilation of a series of quarterly statistics for GDP(E) for Scotland.

Towards the compilation of quarterly series of Scottish GDP(E)

2.3 In considering a specific country case, it is necessary to consider at the outset which QNA series, or types of series, can, while conforming to the IMF principles, be *feasibly* constructed from existing data and incremental data, which could be collected at sensible cost. The present project requires that a proposed series of quarterly Scottish GDP(E) statistics be examined in this light.

2.4 Subject to verification, the following summary is assumed to represent a fair summary of the present state of data availability with regard to Scottish GDP(E).

- Annual current price GDP(E) value figures (subdivided into the main final expenditure components) are available for certain years from the Scottish Input-Output tables. However, the most recent of these, which can be termed “the base year”, is typically 3-4 years out of date, and this situation is likely to persist in the foreseeable future.
- No annual constant price GDP(E) figures are available, which implies, and is implied by, that there are no Scottish GDP(E) price deflators.

- No actual current price quarterly Scottish GDP(E) data are available for any period either before or after the base year.
- No Scottish price data is available, either annually or quarterly, for most (perhaps all) of the components which make up GDP(E).
- Reasonably up-to-date quarterly volume, or quarterly volume indicator, data is available for some components of Scottish GDP(E), and can probably be obtained, or inferred, for others. This is discussed further below.

2.5 To summarise, currently available data for Scottish GDP(E) seems to be restricted to annual current price value estimates for GDP components some years in the past and more recent quarterly volume measures for at least some components of GDP(E). This restricted data set precludes the estimation of some desirable GDP(E) series (in particular, quarterly estimates of *current price* GDP(E) subsequent to the base year) and also precludes some techniques of estimation, (e.g. interpolation from annual GDP(E) figures). Therefore, an important conclusion is that any developments beyond what is proposed below *will require the generation of new data sets*

2.6 Extensive examination of the source technical manuals indicates that there is only one series for Scottish GDP(E) and its components which it would be sensible to attempt to construct from existing data plus, possibly, modest incremental data generation resources. Specifically, this series is *quarterly GDP(E) and its components at base year prices*. This is commonly termed “constant price” or “real” GDP and can be expressed in monetary values or, perhaps more likely, in index form. Happily, this information is among the most useful for analyses of economic growth and international comparisons of performance.

2.7 The proposed method of compiling the series is *volume inflation* and the proposed volume inflator is a *Laspeyres Quantity Index*.

2.8 Formally expressed, a Laspeyres Quantity Index (Lq) is a weighted average of current quarter *quarterly relatives* weighted by base year average quality values. The Lq formula is:

$$L_q = \frac{\sum_i v_i^0 \cdot q_i^1 / q_i^0}{\sum_i v_i^0}$$

Since:

$$v_i^0 = p_i^0 q_i^0$$

Substitution allows the Lq formula to be expressed as:

$$L_q = \frac{\sum_i p_i^0 q_i^0 \cdot q_i^1 / q_i^0}{\sum_i p_i^0 q_i^0} = \frac{\sum_i p_i^0 q_i^1}{\sum_i p_i^0 q_i^0}$$

2.9 This is the form in which the L_q formula is presented in most textbooks, but is much less useful than the original in the Scottish context, for which base year *value* weights are obtainable (see below), but base year *price* weights are not. L_q 's are internationally recognised as "fit-for-purpose" in the present context. While, like any other index, L_q 's are not perfect, they do have certain statistically desirable properties with regard to additivity, etc.

2.10 It can be seen that, to construct a quarterly series of GDP (E) and any of its components and sub-components, information is required on the base value weights, v^0 , and on the up-to-date values of the quantity relatives, q^1 / q^0 . Considering each of these in turn in the Scottish context:

- **Base weights.** The most obvious source of base weights would be a recent Scottish Input-Output table. Indeed, given the level of final expenditure detail in the Scottish I/O tables, this single source would appear to be sufficient to provide *all* of the required weights, subject to the inherent accuracy of the I/O data itself (Note that even if the aggregate base GDP figures are "wrong", if the proportionate breakdowns are correct, then the base weights will also be correct.). The fact that the I/O tables refer to a year rather than a quarter is actually an advantage, since the source manuals recommend that the base for a quarterly series should be *the average quarterly values for the base year not any individual base year quarters*. Hence the required value weights are simply the equivalent I/O table values divided by four, which can be termed v^{0*} . This also applies to base quantities, which can be termed q^{0*}
- **Quantity relatives.** At first glance, construction of the quantity relatives would appear to require information on target quarter quantity volumes, q^1 , and on average base quarter quantity volumes, q^{0*} . Further reflection indicates that is not in fact correct, precisely because what are required are *relatives* or *ratios*. In fact, as empirically measured the outcome quantity relatives are simply pure numbers. This creates two possible aids to compilation:
 - Since it is ratios of change which are required, it becomes possible to consider the use of "volume of business increased by X% last quarter" information. Casual inspection suggests that this type of data is more prevalent in Scotland than hard numerical absolute values.
 - Since the desired quantity relatives are pure numbers, *any* series which provides these numbers *is just as accurate in constructing the L_q as the "actual" series*. This suggests exploring the use of proxies: can series be constructed from data which *is* observable which accurately track the desired series from actual data which is (presumed) *not* observable?

Summary

2.11 From the review of the relevant literature, governments and national statistics bodies, the following questions were identified as central to determining the feasibility of GDP(E):

- Current or constant price quarterly GDP series?
- Absolute GDP value or index numbers?
- Quarterly and annual GDP: independent, integrated, benchmarked?

2.12 Rather than approach these questions in terms of what is wholly desirable, we have considered what data are currently available for Scotland on quarterly basis covering the main components of GDP(E). To a large extent feasibility will be determined by data availability in the following areas:

- Actual quarterly GDP values;
- Quarterly price values or indices; and
- Quarterly volume values or indices.

2.13 The desired outcome is a firm proposal, well founded in theoretical and practical considerations, for a “next steps” project to pilot a Scottish quarterly GDP (E) series.

2.14 Table 2.1 summarises the data requirements to create a current price quarterly GDP (E) series for Scotland. While a base year for GDP (E) can be obtained from Input-Output tables, Scotland does not have data available to provide a current price time-series for each component of final demand (explored further in this report).

Table 2.1: Summary of requirements for a current price quarterly GDP (E) series

Requirement	Availability
Base year GDP (E)	✓
Paasche price series	✗
Laspeyres quantity series	?

2.15 With this in mind; it is therefore not possible to create a new standard index. The alternative approach is to create a volume-adjusted constant price series. A summary of data requirements for this series is provided in Table 2.2:

Table 2.2: Summary of requirements for a constant price quarterly GDP (E) series

Requirement	Availability
Base year GDP (E) (e.g. 2003)	✓
2007 volume inflators	✓

2.16 On this basis, a constant price GDP (E) series seems achievable with existing resources. Using a household expenditure based approach, there is no need to use a Leontief: total consumption is required, so the domestic flow matrix can be the base, combined with an indicator of import intensity (total import flows are available, but not published).

$$A: \text{Domestic GDP (E)} = C_D + I_D + G_D + X$$

$$B: \text{Total GDP (E)} = C_T + I_T + G_T + X - M$$

A – B = total imports at current prices

2.17 Either A or B can be used as the basis for appropriate expenditure weights.

- A is typically the preferred approach. Adding a supply account to get B would then give total GDP (E) for UK comparison. This gives a numerical output (politically desirable), and the ability for numerical testing adds value to the method: tracking indicators can be used for retrospective testing of the method for a period up to 2007.
- A GDP (E) series that is wholly linked to GDP (O) is unlikely to meet Government publication standards.
- The preferred approach advocated by the EU, UN, IMF and World Bank is to find volume indicators for key expenditure components within each category of final demand. This requires a Laspeyres matrix of quantity relatives to make the volume-inflated series.

2.18 Following on from this hypothetical position, the remainder of this report now assesses the approach adopted in other countries producing GDP (E) to identify good practice lessons, and reviews the availability and suitability of Scottish-based data sources for producing a similar GDP (E) series.

CHAPTER THREE CASE STUDIES

3.1 The following section outlines key messages learned from identified comparator case studies. These include:

- The framework employed by the ONS in producing the UK GDP (E) data
- **New Zealand** is currently undertaking a fundamental review of how it produces GDP data. New Zealand faces similar challenges to Scotland in producing economic data and makes extensive use of Input-Output data at the heart of its national accounts. The System of National Accounts (SNA) followed by countries outside of Europe should not be an issue as the SNA is fundamentally the same as ESA95 but ESA95 is more descriptive.
- **Republic of Ireland:** data collection is undertaken using highly pragmatic approach and often with limited resources. The Central Statistics Office Ireland produces quarterly GDP expenditure data, publishes individual expenditure components on a timely basis and also publishes Input-Output tables.

ONS – UK GDP (E) production

3.2 Table 3.1 below summarizes the components of the GDP (E) series produced by the ONS and the main data sources used to measure each component.

Table 3.1: Summary of core data sources for UK GDP (E) production

Description	Components	Main data source
Final consumption expenditure	Household Final Consumption Expenditure	Family Expenditure Survey (FES), National Food Survey (NFS), International Passenger Survey (IPS), government inquiries
	NPISH Final Consumption Expenditure	Detailed annual information is available from universities, trade unions and some other bodies, Update Charities Surveys and NS estimates
	Central Government Final Consumption Expenditure	Combined Online Information System (COINS) (<i>replaced the General Expenditure Monitoring System (GEMS)</i>)
	Local Government Final Consumption Expenditure	COINS/DETR
Gross capital formation	Acquisitions less disposals of tangible fixed assets	NS Inquiries, DETR, MAFF, COINS
	Acquisitions less disposals of intangible fixed assets	NS Inquiries
	Additions to the value of non-produced non-financial assets	Inland Revenue, DETR
	Changes and inventories	NS Inquiries, DETR, MAFF, DTI, COINS
	Acquisitions less disposals of valuables	HM Customs & Excise
Export of goods and services	Exports of goods	Tariff and Statistical Office of HM Customs & Excise
	Exports of services	International Trade in Services Inquiry (ITIS)
Import of goods and services	Imports of goods	Tariff and Statistical Office of HM Customs & Excise
	Imports of services	International Trade in Services Inquiry (ITIS)

3.3 These core components of GDP (E) are now discussed in turn in relation to the production of the UK's quarterly series.

Estimating Household Final Consumption Expenditure (HHFCE)

3.4 The ONS uses five main sources to estimate household spending. Table 3.2 summarises the known issues of each of these, highlighted by the ONS¹.

Table 3.2: Known data issues with UK GDP (E) production – consumer expenditure

Source	Description	Disadvantages
Sample surveys of spending	Households record their spending on goods and services for 1-2 weeks	Differential response: understatement at the top end of the income range
		Alcohol and tobacco consumption is under-reported
		Infrequently purchased items – incidence is too low
		Certain transactions (e.g. financial services and insurance) are impossible to measure consistently with economic accounts concepts
		Surveys do not cover those living in institutions
Statistics of retail and other traders' turnover	Surveys directed at businesses, mainly retailers, but also wholesalers selling to the public and service industries mainly serving customers (e.g. hairdressers, cinemas)	Doesn't cover the full range of goods and especially services purchased by consumers
		Commodity information is not too detailed
		Includes spending by businesses
		Difficulties with covering small businesses
Other statistics of supplies or sales of particular goods and services	Record of goods and services supplied by a single provider or a few providers (e.g. gas, electricity, rail and bus travel)	Information provided may not always be on the basis required for the accounts

3.5 Grossing factors are used to convert survey data to national totals, based on ONS population estimates and average household sizes recorded by the FES. A smoothing process is then applied to mitigate the effects of sampling variation in the survey. For annual estimates this is based on a three-year moving average of the constant price estimates, while for the quarterly series the estimates are based on the average quarterly pattern apparent in the series in recent years. Where differential response is considered to be a problem, often comparatively large upward adjustments are made to a number of commodity groups. Various additions are made to the estimates to cover the expenditure of people living in institutions and, where applicable, foreign tourists (expenditure by foreign tourists is subtracted in aggregate). Expenditure by juveniles is also covered in the FES.

¹ UK National Accounts Concepts, Sources and Methods 1998
www.statistics.gov.uk/downloads/theme_economy/Concepts_Sources_&_Methods.pdf

3.6 Retail sale inquiries only cover Great Britain, so adjustments are made for Northern Ireland. Deductions are made for estimated levels of business expenditure recorded in these surveys based on a telephone survey of small and large businesses. At the same time, the grossing-up of the survey results makes some allowance for sales of small traders who fall below the VAT threshold. Detailed commodity analysis is only available annually, while for the quarterly series the monthly retail sales inquiries are used, which have limited commodity information.

Government Final Consumption Expenditure

3.7 HM Treasury collects expenditure information from all government departments (see Chapter 4.2 on the COINS database – Combined On-Line Information System). ONS2 report that monthly (collected at a high/aggregate level only) and quarterly data are used to monitor all departmental expenditure against the budget. HM Treasury data are adjusted for refunded VAT and for the payment of business rates to conform to National Accounts definitions. Procurement expenditure is supplied net of sales of goods and services, so the figures have to be adjusted to a gross basis by adding back this data. There is generally very little product detail available and no actual price data exists centrally for the prices government pays for its procured inputs, so various proxy deflators are used.

3.8 The Department for Communities and Local Government (DCLG) assembles local government data. In England the main data sources are two annual surveys, one of which is the Revenue Outturn, covering total expenditure and income, from which gross expenditure data are derived by residual: net current expenditure, plus procurement receipts, less compensation of employees, less subsidies, less current grants. The main problem concerning local authority data is timeliness, as the actual data are not available until 7 to 9 months after the end of the financial year.

3.9 The following table (Table 3.3) summarizes the main problems associated with processing government expenditure data, highlighted in the Atkinson review, and also described in this report.

² The measurement and role of government procurement in macroeconomic statistics, 2007
http://www.statistics.gov.uk/elmr/03_07/downloads/ELMR03_07Dey-Chowdhury_Tily.pdf

Table 3.3: Known data issues with UK GDP (E) production – government expenditure

Problem group	Problem	Outcome
Classification issues and a lack of product detail	Outsourcing: services previously occurred in-house contracted to private providers	Previously pay – now procurement
	Local governments in England, Wales and Scotland provide different returns to DCLG	Problems with consistency across the countries when trying to derive UK government expenditure
	Long communication chain involving 40 central government departments	Can lead to inaccuracies and delays in reporting
	Most government procurement information is available only in aggregate terms	Product breakdown is not available for supply-use balancing and accurate deflation
Problems with deflators	Proxy deflators like the producer price index do not reflect product composition of government procurement and prices paid. The split between expenditure on goods and services is not reflected in the proxy deflators.	Because of different inflation rates for goods and service prices in recent years, inappropriate price indices may distort the volume data for government procurement.
	Proxy deflators are based on market prices, while government departments are able to negotiate contracts that allow purchases at discounted rates	As the change in prices rather than their level is important for deflating, if the inflation rates were the same it would not matter for national accounts purposes
Data timeliness and periodicity	For local government, data are only available on a financial year basis rather than quarterly or by calendar year.	ONS uses budget estimates in the long interim period, until the actual outturn data become available, which can cause large late revisions.
	Data are sometimes not available until long after the financial year to which they refer.	

3.10 Many of these problems are addressed by the COINS database. The ONS requires COINS to enable processing of central government data so that quarterly (and monthly) data have the same level of detail as the annual figures. COINS also works on a basis that is gross of charges rather than net. The database is currently being further developed for the coming financial years.

New Zealand

3.11 New Zealand is currently revising and refining its methodology of measuring GDP, including the relevance of Input-Output tables. In terms of the latter, New Zealand uses the Supply and Use balancing approach and intends to publish Input-Output tables on a five yearly basis.

Measuring household final consumption expenditure (HHFCE)

3.12 The components of HHFCE are initially estimated from primary data sources, which include the *Household Expenditure Survey* and the *Retail Trade Survey*. Benchmark years are 1986/87, 1990/91. For these years and annually after that, estimates of expenditure on each commodity are settled with estimates of the production of that commodity, in an inter-industry study analysis. Movements estimated from the surveys each year are linked to the benchmark years. Current price quarterly estimates are reconciled to annual values based on the inter-industry study.

3.13 The Retail Trade Survey is used to provide quarterly estimates based on movements in sales by store type i.e. a volume indicator. This is the method used for estimating expenditure on all commodities purchased primarily from retail stores, with the exception of motor vehicles and alcohol and tobacco products. Smoothing these series between benchmarks provides the quarterly current price series. After that the constant price quarterly series is produced by price deflation of commodities, using sub-indexes of the Consumers Price Index and Retail Trade Survey store type deflators.

3.14 Estimates are provided measuring consumption of all households in New Zealand, regardless their residence status. This is followed by estimating non-resident household expenditure as well as expenditure by resident households overseas.

Measuring government final consumption expenditure

3.15 The main data source for central government spending is the financial accounts of government departments, collected from the System of Integrated Government Management Accounts up until March 1989 and the *Central Government Enterprise Survey* conducted quarterly from June 1989. Central government services include all non-market activities of central government, such as departments, offices of the Crown, and other government organisations such as Transit New Zealand and the New Zealand Fire Services Commission.

3.16 Local government expenditure includes non-trading activities of local authorities. The *Local Authority Survey* collects financial data on the activities of local authorities. This survey includes both the non-market activities and a number of market activities, such as water supply and road works activities.

Measuring increase in stocks

3.17 Two methods are used for measuring changes in inventories in New Zealand.

3.18 The first method is *price revaluation*, which includes a stock valuation adjustment.

3.19 Data is recorded in business accounts on the book values of stock holdings at the beginning and end of each period. To remove the effects of price changes during the period, a valuation adjustment is made to the book value changes referred to as stock valuation adjustment (SVA). The adjusted value of the stock change is described as the value of physical increase in stocks.

3.20 The process includes the following three steps:

1. Book value opening and closing stock levels are deflated to the prices of a chosen base year, so they are expressed in constant prices.
2. The constant price increase in stocks is calculated as the difference between the constant price closing and opening values;
3. The constant price increase in stocks is reflat to the average prices for the period in which the change occurred. This gives the value of the physical increase in stocks.

3.21 The stock valuation adjustment is equal to the difference between the book value stock change and the value of the physical increase in stocks.

3.22 The second method used to measure increase in stocks is *quantity valuation*. This means that the value of the physical increase in stocks is directly calculated by valuing the volume change. However, detailed data on the volumes of items held in stock is rarely available. More commonly, volume data is available as at the beginning and end of the period only. In these cases the volume change is calculated and then valued to the average prices for the current period. No stock valuation adjustment is calculated in these cases.

Measuring gross fixed capital formation

3.23 An all sector supply total is estimated for residential buildings, transport equipment, plant, machinery and other equipment. The general government total for these asset types is estimated separately, and the private sector total is the all sector total less the general government total. Other fixed assets have their private and general government totals estimated separately, and are summed to give the all sector asset type total.

3.24 The all sector supply total for buildings uses work put in place as measured in the Quarterly *Building Activity Survey*. Work put in place is also available for the government sector.

3.25 For transport equipment the all sector supply total is calculated using vehicle registrations * average price. The government sector is estimated using the *Central Government Enterprise, Crown Health Enterprise* (previously a survey of area health boards), and *Local Authority Surveys*. For plant, machinery and other equipment the supply total is calculated as the sum of domestic production plus (net) imports adjusted for additions and withdrawals from stock. Distribution margins are added to obtain purchasers' values. As with transport equipment, estimates of government purchases use the appropriate surveys.

Exports and imports

3.26 Imports and exports are not reconciled to annual values in New Zealand, being in all cases the sum of the four relevant quarters. Exports and imports of goods and services are classified using the Harmonised System Classification (NZHSC).

3.27 Conceptual adjustments to the trade data for goods on consignment are made for timing and valuation differences. The differences are between trade values recorded at the time of exportation and the “true” values when change of ownership occurs. These adjustments are derived from *Balance of Payments quarterly surveys*.

3.28 The Balance of Payments total for transportation, used to measure imports and exports of transport services consists of:

- Non-resident freight payments
- Non-resident air passenger services (air fares)
- Other transport payments

3.29 The data sources for Balance of Payments transportation (imports and exports) include Balance of Payments surveys of resident airlines, resident and non-resident shippers and shipping agents.

3.30 Non-resident freight payments are not included in transportation debits.

Ireland CSO

3.31 The components of annual GDP (E) are issued by CSO Ireland in the annual National Income and Expenditure publication. According to the CSO, the methodology used for the quarterly series are similar to those used for the annual where possible but in many cases alternative methods have been applied.

3.32 *Personal Consumption Expenditure* (=HHFCE) is estimated using primary CSO data, such as the Retail Sales Indices together with some direct inquiries. For goods like fuel and power products and motor vehicles administrative data sources are used. Current price estimates are transformed to constant price using components of the Consumer Price Index (CPI).

3.33 *Net Expenditure by Central and Local Government* is estimated at current market prices. The constant price salary estimates are derived by extrapolating base year estimates using an index of employment or using appropriate wage deflators. At the same time, government expenditure on goods and services is deflated partly by consumer price indices and partly by wholesale price indices.

3.34 *Gross Domestic Fixed Capital Formation* at current market prices includes quarterly estimates on dwellings based on data from the Department of Environment's (DoE) Quarterly Housing Bulletin. Information on other building and construction is obtained from the Department's Review and Outlook publication together with data from the Public Capital Programme.

3.35 Quarterly estimates of commercial vehicles used in the business sector are estimated using administrative data. Estimates of other machinery and equipment are based on import statistics and the CSO Quarterly Capital Assets in Industry Inquiry. Current estimates are deflated using appropriate price indices such as components of the Wholesale Price Index (WPI) and indices for construction activity.

3.36 *Value of Physical Changes in Stocks* at current prices covers stock changes in the agricultural, industrial and distribution sectors and in intervention stocks over the quarter. This item measures the actual value change in stocks between the beginning and end of quarter, also adjusted for any changes in the prices of the underlying commodities. Data sources on industrial and distribution stocks include published and unpublished components of the CSO Quarterly Stocks Inquiry. Agricultural stocks are estimated from the results of CSO's agricultural enumerations and statistics on animal slaughtering, etc. Constant price estimates are calculated by deflating the current estimates using relevant price indices and price data on agricultural and intervention stocks. Some adjustments have been made to the stocks values to improve the coherence of the quarterly accounts. These are judgmental adjustments to allow for within-year timing differences between the output and expenditure measures. Over a calendar year, these adjustments are neutral.

3.37 *Exports and Imports of Goods and Services* at current prices are taken from the CSO Balance of Payments series. An adjustment is made for FISIM (Financial Intermediation Services Indirectly Measured). Current price estimates are converted to previous year prices using the available price indices, including export and import unit value indices. A very significant fall in the pattern of distributive type trade with Great Britain in Electrical machinery and parts in 2002 has a very large influence on year-on-year comparisons of both exports and imports for 2003 and the latter part of 2002. While the comparisons of gross flows are considerably influenced, the net balance of trade is not significantly affected.

3.38 Table 3.4 below summarises the main sources used by the ONS, Statistics New Zealand and CSO Ireland when measuring quarterly GDP (E):

Table 3.4: Summary of sources adopted

	UK - ONS	New Zealand	Ireland - CSO
HHFCE	Family Expenditure Survey; National Food Survey; International Passenger Survey; Government inquiries	Household Economic Survey, Retail Trade Survey	Retail Sales Indices Direct inquiries
Imports and Exports	Tariff and Statistical Office of HM Customs & Excise, International Trade in Services Inquiry (ITIS), INTRASTAT system based on VAT records, International Passenger Survey	Balance of Payments surveys of resident airlines, resident and non-resident shippers and shipping agents.	CSO Balance of Payments series
Inventories	Quarterly Stocks Inquiry NS Inquiries; DETR; MAFF; DTI; GEMS	Difference between the closing and opening book values of stocks + stock valuation adjustment	CSO Quarterly Stocks Inquiry, CSO's agricultural enumerations & statistics on animal slaughtering, etc.
GGFCE	General Expenditure Monitoring System (GEMS) DETR	System of Integrated Government Management Accounts, Central Government Enterprise Survey, Local Authority Survey	Government records
GFCF	Quarterly Capital Expenditure Inquiry (CAPEX) NS Inquiries; DETR; MAFF; GEMS, Inland Revenue, HM Customs and Excise	Quarterly Building Activity Survey Vehicle registrations * average price, Central Government Enterprise Survey, Crown Health Enterprise Survey Local Authority Survey <i>Equipment</i> : the sum of domestic production plus (net) imports adjusted for additions and withdrawals from stock	<i>Dwellings</i> : DoE Quarterly Housing Bulletin <i>Other construction</i> : DoE Review and Outlook, Public Capital Programme <i>Commercial vehicles</i> : administrative data Other machinery & equipment: Import statistics, Quarterly Capital Assets in Industry Inquiry
NPISH	Detailed annual information available from universities, trades unions and some other Bodies Update Charities Surveys NS estimates.		

CHAPTER FOUR MEASURING SCOTTISH GDP (E)

4.1 There are 2 alternative routes to modelling Scottish GDP (E) assessed within this report:

- Linking to the existing quarterly GDP (O) series; and
- Following ESA conventions to create an independent / adjusted series

4.2 These approaches can incorporate a number of key development stages:

- **Stage 1:** Converting Scottish quarterly GDP (O) into final demand sectors using coefficients from the latest Scottish IO tables
- **Stage 2:** Apply UK weightings to the Scottish series
- **Stage 3:** Adjusting for final demand sectors: refining the series for available primary expenditure data
- **Stage 4:** Adjusting for known consumer spending levels, government and trade
- **Stage 5:** Conversion from a volume index to constant prices then to current prices

Creating a GDP (O) linked series

4.3 Scotland's national accounts: Input-Output tables provide a breakdown of the components of final demand (by value) across 123 sectors on an annual basis. Using the commodities matrix to create coefficients for each sector (the share of each component of final demand within total demand) it is possible to weight the quarterly GDP (O) series.

4.4 The Scottish Government publishes a quarterly series of GDP (O), comprising numerous indices across all sectors. Using these individual indices, the Government has provided the GDP (O) quarterly series across the 123 sectors used by Input-Output tables for the purposes of this study. The quarterly GDP (O) series is un-adjusted for seasonality at this stage.

4.5 The GDP (O) series provided by the Government is an index, rather than actual values. In order to be able to apply the final demand coefficients to each individual sector, the GDP (O) index had to be monetised. This was done using the 2003 Input-Output tables as the benchmark year for the value of output in each sector³.

4.6 For example, in the agriculture sector (IO group 1):

- Total demand for products in 2003 was £2,616 million for the agriculture sector. Taking a quarter of this as a baseline (£654 m) and applying it across the quarterly index for the series gives a constant price series. This monetisation stage is necessary so that the 123 individual series' are relatively weighted when

³ Input-Output tables do not currently offer a continuous series, so a benchmark year is required, rather than applying individual years' data to the index.

combined to give final demand, rather than an aggregation of bespoke indexes (out of 100) that have equal weights.

- The following table (Table 4.1) summarises total demand coefficients for the agriculture sector, based on the 2003 national accounts:

Table 4.1: Example of final demand coefficients applied for the Agriculture sector

Agriculture - demand type		2003 £ Million	Coefficient (Share of total demand)
1 - Intermediate demand	Total	£1,264	48%
	Households	£699	27%
2 - Final consumption expenditure	NPISHs	£1	0.0%
	Tourist Expenditure	£12	0.4%
	Central Government	£0	0.0%
	Local Government	£1	0.0%
	Total	£712	27%
	GFCF	£58	2.2%
3 - Gross capital formation	Valuables	£0	0.0%
	Change in Inventories	£0	0.0%
	Total	£58	2.2%
	RUK	£510	19%
4 - Exports	RoW	£72	3%
	Total	£582	22%
	5 - Total Final demand (2+3+4)	Total Final Demand	£1,352
Total Demand for Products		£2,617	100%

- These coefficients were then used to apportion spending across the demand sectors – multiplying through the monetised series for each quarter. For example, in the agriculture sector, 27% of the quarterly series was attributed to consumers, 22% to exports etc.

4.7 This process was replicated across all 123 sectors. Aggregating across all sectors for each demand component gives a GDP (O) linked series.

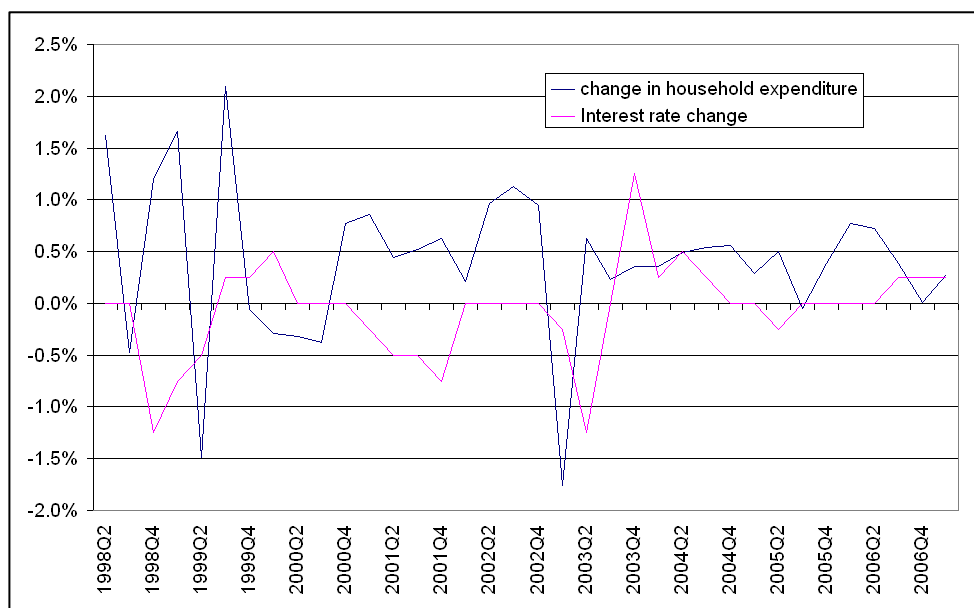
4.8 This process yields new estimated GDP (E) series for each of the components of final demand, which, when aggregated will be equal to the GDP (O) series. This method simply offers a re-apportionment of output between final demand sectors on a fixed basis. Clearly, this use of a benchmark year (and thus fixed coefficients) for each sector means that the series will mask changes in final demand components between quarters. For example, GFCF is the strongest final demand sector for construction, so when output of construction increases, GFCF is assumed to be increasing in proportion.

4.9 Using this estimated series as a benchmark, we have compared the preliminary results of this GDP (O) linked model with some initial proxy indicators for each final demand component to assess the relative fit / correlation. The results of this process are presented below for each component of final demand in turn.

Households

4.10 Figure 4.1 benchmarks estimated quarterly change in the stage 1 household expenditure series against percentage change in the Bank of England base rate. Increasing interest rates will increase the cost of borrowing and make saving more attractive, thus a negative correlation would be expected between the 2 series, with consumer spending falling as interest rates increase.

Figure 4.1: Quarterly % change in household expenditure vs. Interest rate change

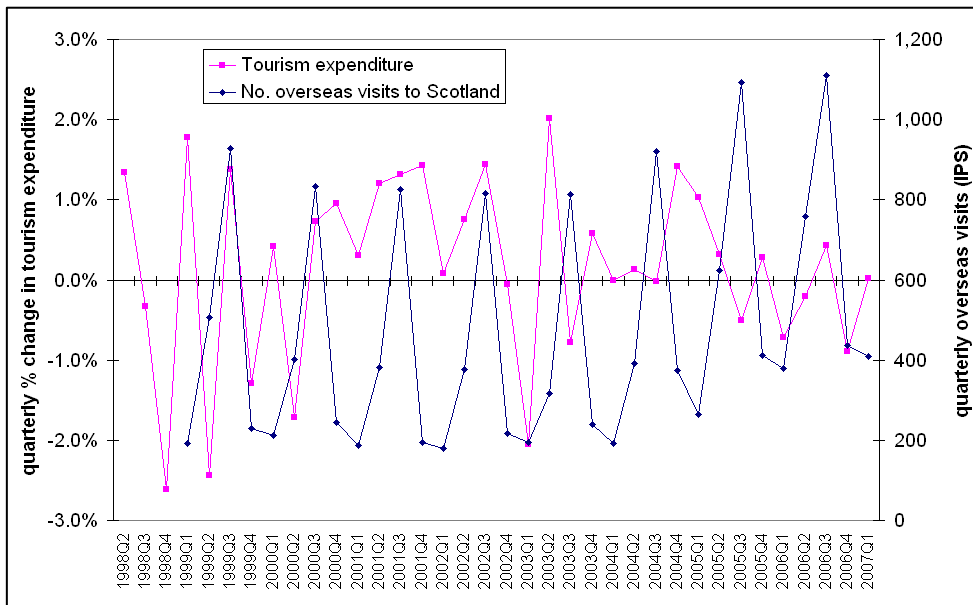


4.11 This initial model suggests a negative, but weak correlation between the two indicators (-10%), as sense would dictate.

Tourism

4.12 Figure 4.2 illustrates the change in the modelled quarterly tourism expenditure series against changes in the volume of overseas visits to Scotland from the International Passenger Survey. While the sample size for the IPS is questionable when looking at individual quarters, this initial test shows a positive correlation between volume of tourists and their modelled expenditure across the 10-year period. Again, this correlation is increased as we have modelled expenditure using the GDP (O) series that is un-adjusted for seasonality.

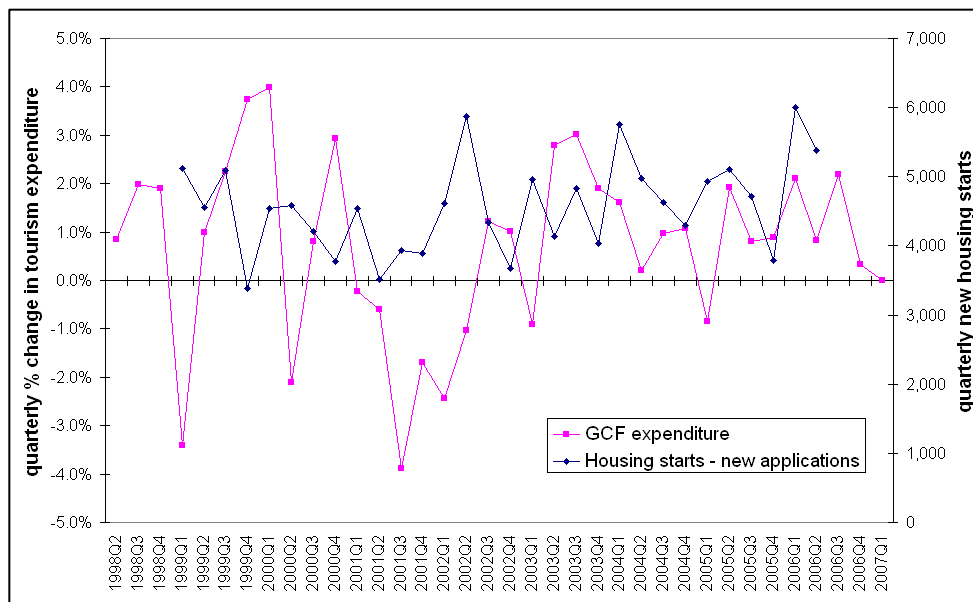
Figure 4.2: Quarterly change in tourism expenditure vs. volume of overseas visits



Gross Capital Formation (GCF)

4.13 Quarterly changes in the modelled GCF expenditure series and the volume of applications for new housing starts are presented in Figure 4.3. There is a weak negative correlation between the two series that is not logical (-7%), thus suggesting that the modelled series may be particularly inaccurate for this component of final demand.

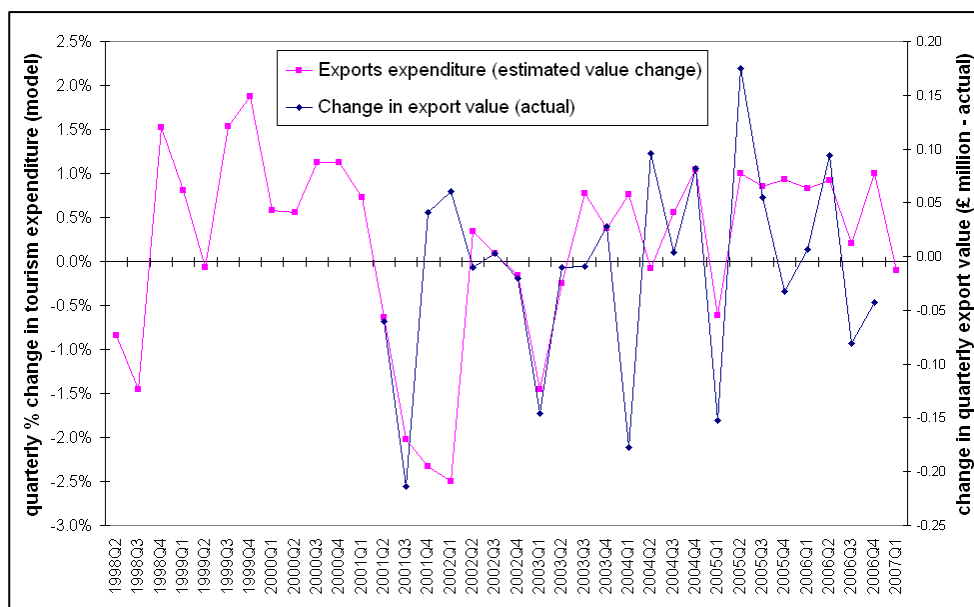
Figure 4.3: Quarterly change in modelled GCF versus volume of new housing starts



Exports

4.14 Figure 4.4 illustrates the relative quarterly change in modelled export expenditure and actual export expenditure for overseas trade as recorded by HM Revenue and Customs. The close trend pattern between the two is intuitively sound, and thus suggests that the rough stage 1 model is a fair approach to this final demand indicator.

Figure 4.4 – Modelled versus actual quarterly change in export expenditure



4.15 These modelled GDP (O) linked results for Scotland can also be tested against the published UK GDP (E) results up to 2007 Q2 to assess the consistency of apparent trends and patterns over final demand components and quarters. For each quarter over the last 10 years (1998 Q1 to 2007 Q2), we have modelled the share of each component of final expenditure within GDP (E) for the UK series and correlated this pattern with the modelled Scottish series. This process of benchmarking coefficients yields the following key messages:

- Variation in final demand coefficients between quarters is low in the UK series – overall shares of final demand groups remain relatively constant, suggesting that fixed quarterly coefficients in Scotland, based on the IO tables, may not be a terminal problem.
- There is strong correlation between Scottish and UK coefficients in government spending and exports across the 10-year period (38 quarters) – the areas where there is the most comprehensive data available, thus accuracy will be stronger. Table 4.2 illustrates average coefficients for each series and the correlation between the two over the period.
- There is a weak negative correlation in GFCF. This could make sense if Scotland is competing with the other UK regions for investment, but may also reflect the acknowledged shortage of robust data sources in this area.

Table 4.2: Modelled Scottish GDP (E) comparison with ONS GDP (E) trends

Final demand component	Scotland coefficient	UK coefficient	Correlation 1998 Q1 to 2007 Q1
Households / NPISH	31%	50%	9%
Government	21%	15.6%	90%
GFCF	6.9%	13.8%	-12%
Exports	41.1%	20.6%	50%

Creating an independent GDP (E) series

Components of final demand from a base year

4.16 In order to produce an independent GDP (E) series, primary sources need to be identified for each of the components of final demand i.e.

- Consumer spending (households, NPISH and tourist expenditure)
- Investment spending (GFCF)
- Government spending (Central and local government spending)
- Exports & imports (to rest of UK / rest of the world)

4.17 Again, the Input-Output tables can be used as a baseline to identify the key expenditure components within each group of final demand, which can then be measured individually or through proxy indicators. The more components that are included in the series, the more accurate an estimate it will offer. Each of the final demand groups is now examined in turn.

Consumer spending

4.18 Table 4.3 illustrates the profile of consumer spending by value across the 123 Input-Output sectors. Half of all consumer expenditure (48%) is concentrated in just 3 sectors: retail distribution, letting of dwellings and hotels, pubs & catering. Adding a further 4 sectors means that some 70% of all consumer spending is accurately captured.

Table 4.3: Components of consumer spending

Expenditure sector	Consumer type Value of consumer expenditure, £ million				Share of total spending	
	Households	NPISHs	Tourism	Total	Individual sector	Cumulative
Retail distribution	6,998	1	200	7,199	20%	20%
Letting of dwellings	6,809	0	39	6,848	19%	39%
Hotels, catering & pubs etc	2,447	0	890	3,337	9%	48%
Wholesale distribution	2,061	0	60	2,122	6%	54%
Recreational services	1,616	255	134	2,004	6%	60%
Education	351	1,418	10	1,779	5%	65%
Insurance & pension funds	1,501	27	4	1,532	4%	69%
Motor vehicle distribution & repair, etc	1,330	0	16	1,346	4%	73%
Telecommunications	846	0	29	875	2%	75%
Electricity production & distribution	755	0	0	755	2%	77%
Other land transport	729	0	22	751	2%	80%
Agriculture	699	1	12	711	2%	82%
Other service activities	579	20	15	615	2%	83%
Coke, refined petroleum & nuclear fuel	471	1	54	526	1.5%	85%
Railway transport	364	0	22	386	1.1%	86%
Health & veterinary services	242	119	6	367	1.0%	87%
Other sectors (None with an individual share > 1%)	4,260	380	104	4,744	13%	100%

Notes to table

Source: Scottish Government, 2003 Input-Output tables, Industry by Industry matrix

4.19 Looking at individual groups within consumer expenditure, domestic households have the widest spread of expenditure, and thus require more sectors to be measured.

4.20 By contrast, the majority of tourism expenditure (55%) is captured in a single sector – hotels, catering & pubs. Adding retail (or general shopping) takes this total to 67%, and general travel to 83%. Each of these expenditures is published by Visit Scotland, based on the International Passenger Survey and United Kingdom Tourism Survey. Quarterly results for visitor numbers and expenditure are available as results are produced for seasons, with around a 1-year lag. 2006 are the latest available figures.

Investment spending

4.21 Table 4.4 illustrates the profile of investment spending by value, again based on the 2003 IO tables Industry by Industry matrix. Construction alone counts for 68% of all investment spending. Adding computing and recreational services takes this to 75%, or three quarters of total investment spending.

Table 4.4: Components of investment spending (GFCF)

Expenditure sector	Investment type Value of expenditure, £ million				Share of total spending	
	GFCF	Valuables	Inventory change	Total	Individual sector	Cumulative
Construction	5,370	0	35	5,405	68%	68%
Computing services	325	0	2	327	4%	72%
Recreational services	207	0	0	207	3%	75%
Estate agent activities	207	0	0	207	3%	77%
Office machinery & computers	203	0	0	203	3%	80%
Architectural activities etc	180	0	8	188	2%	82%
Wholesale distribution	170	0	0	170	2%	84%
Legal activities	149	0	3	152	2%	86%
General purpose machinery	135	0	0	135	2%	88%
Other sectors (None with an individual share > 1%)	803	32	116	950	12%	100%

4.22 There is an acknowledged data shortage in this area, so it makes more sense to combine the proxy indicators that are available, to refine the total coverage of the series, albeit that they count for a lower single share of total expenditure. For example:

- Housing completions;
- Investment in office machinery; and
- Company car investment.

Government spending

4.23 Half of all government spending (49%) is accounted for by public administration. Adding health and education expenditure gives 90% coverage of all public sector spending. Table 4.5 illustrates the share of key components within government expenditure, taken from the 2003 IO tables as a baseline.

Table 4.5 – Components of government spending

Expenditure sector	Government spending type Value of expenditure, £ million			Share of total spending	
	Central government	Local government	Total	Individual Sector	Cumulative
Public administration	8,635	3,503	12,138	49%	49%
Health & veterinary services	6,597	0	6,597	27%	76%
Education	0	3,529	3,529	14%	90%
Social work activities	0	1,390	1,390	6%	96%
Recreational services	0	629	629	3%	98%
Sewage & sanitary services	0	424	424	2%	100%

4.24 At present, the published quarterly GDP (O) series for Scotland measures government productivity through a system of input spending (weighted by changes in staff numbers taken from the ONS Joint Staff Watch with Scottish weightings). However, at time of production of this report, we understand the Scottish Government are looking to move towards a more advanced system of weighted output measure. For example, measuring pupil numbers, weighted by attainment levels, rather than a count of teachers.

4.25 By definition, the existing input-based measures are naturally better suited to GDP (E) measurement. Therefore, the existing GDP (O) measure for public sector spending based on the joint staff watch, albeit flawed, could be used as the basis for the GDP (E) series. Once removed from the GDP (O) series, this would offer an independent series to inform the GDP (E) series.

4.26 However, an alternative dataset is also available and potentially offers a direct measure of Scottish government expenditure. HM Treasury's Combined Online Information System (COINS) database stores three sections of government expenditure data:

- Budgetary information
- Current year monthly spend
- Audited accounts

4.27 Budgetary information is available in the COINS data for the current year, several past years and some years forward, so it has a 9-year spread. This is available on an annual basis.

4.28 More relevant is the **current year expenditure data, which is available on a monthly basis**. Departments provide data on their monthly spend by the 8th working day of the following month. They also provide data for any previous months as necessary, for example in the case of late transactions. There is also a forward-looking profile in the monthly returns, as the departments have to provide their best estimate of spending in the coming months until the end of the financial year⁴.

4.29 This expenditure data held in the database is available at a very detailed level, grouped by functions such as expenditure on schools, roads, housing, and health. However, the COINS database focuses on central government spending, thus **local authority expenditure data is only collected once a year**. Data is available on the grants provided by the central government to local authorities, with double counting avoided. Any measure of LA expenditure may therefore have to be supplemented by a weighting from the Joint Staffing Watch employee count measure.

4.30 Other attributes of the system include a breakdown of current and capital spending, and data is also split according to which part of the budget the data falls into. For example, separate data is available for the department of expenditure limits, annually managed expenditure (which includes more volatile spending, e.g. pension payment, cost capital charge for roads), and non-budget expenditure (for example in the case of payments within departments the first payment is recorded as non-budget spending to avoid double counting). The database also breaks down consumption, non-cash and capital expenditure, and shows whether the expenditure contains receipts.

⁴ The database also holds information on audited accounts, however, that is of less relevance to this study.

4.31 The COINS also holds economic activity data, for example on wages and salaries, purchase of goods and services, capital spending, depreciation, plants and machinery and so forth in great detail.

4.32 In terms of accuracy, we understand from HM-Treasury that data from Scotland is of high quality compared with other UK regions, arrives promptly and contains very few gaps. According to HM-Treasury, the finance team in Scotland are determined to get the right data, and in terms of data provision they are one of the best departments supplying timely data of very good quality.

4.33 At present, the main uses of the COINS database are the following:

- Government departments use it themselves – the Treasury encourages them to take ownership of their data, boosting its accuracy;
- It is used in Treasury publications on public spending throughout the year (e.g. the Public Expenditure Statistical Analysis (PESA) publication)
- It is also used by the ONS, who receive a monthly load of data, which they use in developing their statistics on spending and quarterly GDP (E).

4.34 The presentation of data in terms of current prices presents some difficulties in including this otherwise robust and timely source of data. However, the significant detail on central government expenditure suggests some adjustment could be made.

Exports / Imports

4.35 This component of GDP(E) is the most difficult to measure and few comprehensive sources of accurate data exist. It is unlikely that a consistent quarterly volume measure of imports and exports could be constructed for Scotland.

4.36 However, given that other components of expenditure can be measured on a quarterly basis (households and tourism expenditure), we can show what goods and services are produced in Scotland balanced against goods and services consumed in Scotland. This approach may be particularly useful given that household and tourism expenditure account for a significant share of imports. Actual export and import data are available from HMRC for trade outside of the UK.

4.37 The following tables review the data sources available that directly record or proxy the various components of final demand, and their core expenditure components.

Sources for building an independent GDP (E) series

Table 4.6: Summary of data sources to measure consumer expenditure

GDP Component	Top Expenditure Categories	Current Quarterly GDP (O) Source	Suitable for GDP (E) Volume Inflation?	Quarterly GDP (E) Alternative
C (Consumer Spending)	Retail distribution	Deflated turnover from the retail sales inquiry Coverage: food and non-food stores and non-store retailing and repair	X	ONS Family Expenditure Survey, Expenditure & Food Survey – coverage for domestic retail purchases Visit Scotland / International passenger survey – coverage for tourist retail expenditure
	Letting of dwellings	Number of dwellings being let, adjusted by number of rooms from the Family Resources Survey. Volume of house sales (Registers of Scotland) Coverage: private and social letting estimates	✓	RICS (Royal Institute of Chartered Surveyors), lettings market survey Coverage: volume and expenditure of students, social, corporate and private tenants
	Hotels, catering & pubs etc	Deflated turnover for hotels & accommodation, restaurants and bars from MIDSS	X	Sources as per retail distribution Coverage: domestic and tourist expenditure on hotels, catering and pubs
	Wholesale distribution	Deflated turnover for wholesale on a fee or contractual basis from MIDSS Coverage: agricultural raw materials and live animals, food, beverages and tobacco, household goods, non-agricultural int. products, machinery, equipment and supplies	X	Sources as per retail distribution Coverage: expenditure by product type covers both retail and wholesale purchases
	Recreational services	UK level series for FTE employees from the ONS Joint Staffing Watch (with Scottish weighting). Coverage: LA libraries and museums, LA recreational services, leisure & tourism + Consumer expenditure on sport, other recreation and leisure services and betting & gaming	?	Sources as per retail distribution Coverage: domestic and tourist expenditure on recreation and leisure services

Table 4.7: Summary of data sources to measure investment expenditure (GFCF)

GDP component	Top Expenditure Categories	Current Quarterly GDP (O) Source	Suitable for GDP (E) Volume Inflation?	Quarterly GDP (E) Alternative
I (Investment spending)	Construction	BERR (formerly DTI) deflators across construction series + social housing from Scottish Government Housing department Coverage: public housing, private housing, other public, private industrial and commercial, public and private R&M	?	National House Builders Council, number of new housing start applications RICS (Royal Institute of Chartered Surveyors), market surveys of construction and housing. Coverage: volume of construction activity, number of new housing applications and completions
	Computing services	Deflated turnover for computers and related activities sector from MIDSS	X	Bank of England / ONS – Chain linked investment in computer equipment, software and telecoms
	Recreational services	UK level series for FTE employees from the ONS Joint Staffing Watch (with Scottish weighting). Coverage: LA libraries and museums, LA recreational services, leisure & tourism. + Consumer expenditure on sport, other recreation and leisure services and betting & gaming	?	ONS Family Expenditure Survey, Expenditure & Food Survey – coverage for domestic recreation & leisure spending Visit Scotland / International passenger survey – coverage for tourist recreation & leisure expenditure
	Estate agent activities	Number of dwellings being let, adjusted by number of rooms from the Family Resources Survey. Volume of house sales (Registers of Scotland). Coverage: private and social letting estimates	✓	RICS (Royal Institute of Chartered Surveyors), market survey of lettings Coverage: commercial volume and expenditure of students, social, corporate and private tenants
	Office machinery & computers	Individual series for dominant companies, with remainder based upon a panel of companies (the Monthly Production Inquiry). Scottish Gov. are currently looking to move to a standard ratio estimation approach Coverage: Computer and Office Machinery sector, Company specific series used for dominant companies.	?	Bank of England / ONS – Chain linked investment in computer equipment, software and telecoms

Notes to table

NB: Data is also available on vehicle registrations from the DVLA. Although this is a less significant component of GFCF, it is an available dataset that could boost the overall coverage and quality of a series that has traditionally been difficult to proxy.

Table 4.8: Summary of data sources to measure government expenditure

GDP component	Top Expenditure Categories	Current Quarterly GDP (O) Source	Suitable for GDP (E) Volume Inflation?	Quarterly GDP (E) Alternative
G (Government spending)	Public administration	Count of Civil Servants and employees in Local Government NEI from the Cabinet Office, Joint Staffing Watch (NB: to be replaced with a revised measure to incorporate grade drift estimates)	✓	HM-Treasury COINS database (Combined Online Information System) Coverage: current year monthly spend by Scottish department (but specified in current prices)
	Health & veterinary services	Number of admin and clerical staff in the NHS + NHS employees in employment from the Joint Staffing Watch (NB: due to be replaced with a measure of deflated total inputs)	✓	
	Education	Employee numbers from the Joint Staffing Watch and Education department. Coverage: primary, secondary and HE / FE school teachers, other LA education employees, university lecturers, grant aided and independent teachers (NB: currently being replaced by cost-weighted activity indices)	✓	
	Social work activities	FTE employees in LA and non-LA social work activities from the Joint Staffing Watch (NB: currently being replaced with cost-weighted activity indices)	✓	

Table 4.9: Summary of data sources to measure net export expenditure

GDP Component	Top Expenditure Categories	Current Quarterly GDP (O) Source	Suitable for GDP (E) Volume Inflation?	Quarterly GDP (E) Alternative
X – M (Net exports)	Insurance & pension funds	Net receipts from the Scottish extract of the ONS survey of UK insurers Coverage: Banking Indices, SC Building Society and pension funds	X	HM Revenue and Customs – value and volume of exports and imports by product / service type Coverage: non-UK trade only – excludes intra-UK trade. Household, tourism and investment expenditure on imported goods and services captured in the Expenditure and Food Survey and IPS / Visit Scotland, need to be aware of scope for double counting.
	Banking	Fee and commission income from the Committee for Scottish clearing banks (Some difficulties noted engaging the industry)	X	
	Office machinery & computers	Individual series for dominant companies, with remainder based upon a panel of companies (the Monthly Production Inquiry). Scottish Gov. are currently looking to move to a standard ratio estimation approach Coverage: Computer and Office Machinery sector, Company specific series used for dominant companies.	?	
	Spirits & wines, etc	HMRC volume data, ONS quarterly Stocks Inquiry, producer price indices and Beer and Malt Monthly Production Inquiry Coverage: spirit manufacture (whisky), beer and malt manufacture	✓	
	Ancillary transport services	Volume of motor vehicles repair and servicing from MIDSS Air transport: number of passengers passing through Scottish airports from the CAA	✓	

CHAPTER FIVE QUALITY TESTING SCOTTISH GDP (E)

Overview of ESA / SNA indicators - definitions

5.1 The ONS is currently working to develop and implement a coherent, comprehensive, effective and systematic approach to quality measurement and reporting. A key objective is that all ONS outputs will be accompanied by a range of quality measures and indicators so that users are able to understand the strengths and limitations of official statistics and how to use them appropriately.

5.2 This standardised approach to quality measurement should facilitate:

- Monitoring improvements in data management
- Implementation of changes to drive continuous improvement
- Comparability of data from different sources / regions

5.3 The latest iteration of their Guidelines for Measuring Statistical Quality (2006)⁵ highlights 6 key dimensions of quality for statistics. These are:

- Relevance
- Accuracy
- Timeliness & punctuality
- Accessibility & clarity
- Comparability
- Coherence

5.4 Table 5.1 provides a summary of each dimension, offering a definition and range of measurable performance indicators. These indicators are then used to make an assessment of the available sources for an independent Scottish GDP (E) series.

⁵ Available at: http://www.statistics.gov.uk/downloads/theme_other/Guidelines_Subject.pdf

Table 5.1: Summary of international quality measures

Dimension of Quality	Definition	Performance measures
Relevance	The extent to which the coverage and content of the series meets the needs of users.	Describe how the data relate to the needs of the users, and identify gaps
Accuracy	The fit of the estimated series with the (unknown) true value.	Coverage errors Non-response errors Measurement errors Processing errors Model assumption errors
Timeliness & punctuality	The lags between publication and the time period of the series, and between actual and planned publication dates.	Frequency of release Production time Punctuality of release
Accessibility & clarity	The ease with which users can view data (access and format) and extent of guidance notes.	Dissemination Assistance to locate information
Comparability	The extent to which the series is comparable over time and area.	Over time Over spatial domains Over sectors / groups
Coherence	Data from different sources, but referring to the same trend, are similar.	Compare estimates with other estimates on the same theme

5.5 Some of these indicators are of particular relevance to Scottish quarterly GDP (E) at this stage, while others can be treated more generally. For example, issues of accessibility & clarity can be managed ex-post, once it has been established that the series can be produced. It is also too early at this stage to assess coherence until an actual series exists that can be benchmarked against GDP (O) or UK GDP (E). For the purposes of this study, coherence is covered within the assessment of accuracy and comparability.

5.6 Table 5.2 overleaf summarises the available Scottish data sources against the remaining international quality assessment indicators, identifying the relative strengths of the local data and the gaps and weaknesses where further research may be required to bolster estimates.

Table 5.2: Matrix assessment of available Scottish data

GDP component	Available indicators	Quality Assessment Indicators				Overall assessment of indicator
		Relevance	Accuracy	Timeliness & punctuality	Comparability	
C Consumer Spending	ONS Expenditure & Food Survey (formerly Family Expenditure Survey)	Household's account for 52% of consumer expenditure. Survey contains detailed breakdowns of household expenditure.	Collected annually then weighted for quarterly results. Set sample is 12,000 households. Full response is expected for around 63% of addresses.	Last published 1 st May 2007 for 2005/06 ⁶ - a 1 year lag	Main source for UK quarterly GDP (E) so directly comparable	Medium
	International passenger survey (Visit Scotland reports the details of categories of visitor spend)	Tourist expenditure accounts for 5% of Scottish consumption and a core national industry	¼ million face-to-face interviews carried out each year with tourists entering/leaving the UK from airports, seaports and channel tunnel. Scotland sample more variable.	Published quarterly with a lag of 2 quarters	Core source for UK quarterly GDP (E) so directly comparable	Medium
	RICS Lettings market survey	Coverage for tenant demand, gross yields, rent expectations and average monthly rents	Covers students, social, corporate and private tenants in survey of all registered companies with the professional industry body	Published quarterly with a lag of 1-2 quarters	Varies from UK and Scottish GDP (O) sources, but used by the Bank of England for forecasting, so a recognised source	Strong
I Investment (GFCF)	National House builders Council	Construction represents 70% of total investment spending in Scotland	Coverage of 20,000 registered builders who construct 80% of UK housing.	Published quarterly with a lag of 1 quarters + occasional monthly key indicators	Varies from UK and Scottish GDP (O) sources	Strong

⁶ http://www.statistics.gov.uk/downloads/theme_social/Family_Spending_2005-06/Familyspending2005-06.pdf

GDP component	Available indicators	Relevance	Accuracy	Timeliness & punctuality	Comparability	Overall assessment of indicator
I cont. Investment (GFCF)	RICS Construction market survey and housing market survey	Covers trends in house building activity, labour availability, expected profit margins and publicly-funded building infrastructure projects	Professional industry body comprehensive coverage for public & private housing, commercial, industrial and infrastructure construction	Published quarterly with a lag of 1-2 quarters	Varies from UK and Scottish GDP (O) sources, but used by the Bank of England for forecasting, so a recognised source	Strong
	Bank of England / ONS – Chain linked investment in computer equipment, software and telecoms	Combined, these factors account for a significant share (5%) of total investment	Quarterly weights are applied to annual data and revised intermittently	Hardware – available with a 1 year lag Software – new, so currently under review	Chain-linking method used by BoE and ONS to assess quarterly investment	Weak
	DVLA vehicle registrations	Volume of new registrations to proxy investment in motor vehicles	Comprehensive coverage for new registered vehicles	Up to date	Varies from UK GDP (E) series, but published and used by Dept. of Transport	Weak
G Government Spending	ONS Joint staffing watch with Scottish weighting	Central and local government spending accounts for around 21% of total final demand in Scotland	UK figures adjusted with Scottish weighting	Available with a lag of 2 quarters for GDP (O)	Dependant on Scottish weightings applied	Medium
	HM-Treasury COINS database		Comprehensive coverage for Scottish departments, but low detail for local authorities	Currently under review for up-to-date reporting	Increasing relevance in the UK series as the database is refined and developed further	Strong
X – M Exports / Imports	HMRC trade statistics	Trade will be captured to a degree within the other components of expenditure, due to the method of collection e.g. the Expenditure & Food Survey.	Comprehensive coverage of all non-UK trade, but excludes intra-UK flows. This can be used to offer weightings for an assessment of trade within overall expenditure.	Available with a lag of 2 quarters	Core source for UK quarterly GDP (E) and Scottish GDP (O) so directly comparable	Medium / Weak

CHAPTER SIX USERS OF GDP (E)

Press search results

6.1 To measure the relative extent of press coverage in England and Scotland across the economy and GDP (E) indicators, we did a press search of key terms during the last 12 months. This offers an indication of the scope and interest in GDP (E) statistics in Scotland and the UK (where stats are more widely available). Notable trends appear to be:

- The Scottish press is economically literate, with a high incidence of technical economic reporting. The results suggest Scotland is making better use of the regional statistics available – there is a higher incidence of GVA / productivity reporting (Scotland specific – the GDP (O) series) and relatively lower GDP reporting (which is based on UK-wide info).
- There is a lower Scottish incidence of consumer and retail spending stories. These aspects of the economy received the highest incidence across UK reporting, potentially suggesting strong public & industry interest in GDP (E) for Scotland if the series were made available.
- Scottish reporting is more interested in tourism, reflecting the national specialisation. This could suggest a wide potential market for use of GDP (E) statistics if available, and the need for better market understanding. Scotland also appears to have a stronger interest in government spending, though this could simply reflect the Scottish election period.

CHAPTER SEVEN CONCLUSIONS AND RECOMMENDATIONS

- The preferred approach advocated by the EU, UN, IMF and World Bank for producing quarterly GDP (E) is to find volume indicators for key expenditure components within each category of final demand. Scotland had available data sources (albeit with some gaps and weaknesses) to deliver such a series.
- Following international guidelines, the only quarterly GDP (E) series that Scotland can deliver with existing data sources is a constant price series using a base year and volume inflation for individual series and quarters.
- There is sufficient data available across the government spending and consumer demand components of final demand to make a volume adjusted series. Many of these indicators are based on the same sources as applied by the ONS to produce the UK GDP (E) series. Thus, the series should be comparable for benchmarking.
- Limitations – circular references with Input-Output tables and GDP(O) will not necessarily compromise the quality of the series but any links should be explicitly stated.
- Recommendations for strengthening data:
 - The most significant individual component of final demand is household spending, thus the most obvious way to enhance the quality of the data would be to sponsor a boosted sample in Scotland for the ONS expenditure and food survey.
 - Notable data gaps are with investment spending (GFCG), though a significant share of spending can be accounted for by very few sectors. In particular, the construction industry and use of computer equipment. Thus, the Scottish Government should consider RICS consultation to make best use of the available industry volume information.
 - Another notable gap is the extent of intra-regional trade within the UK. This can be modelled, as non-UK trade with Scotland is measured and strongly correlated with total trade on an annual basis.
- Base year weights:
 - The base year weights are of equal importance to the volume (or value) change in a series, because series are multiplicative and base year weight errors will be compounded over time.
 - The development of a single set of high quality Input-Output tables in the chosen base year would provide base year weights for GDP(E) and possibly improve the weights currently used for GDP(O) (also based on Input-Output data).

- Although take from the same Input-Output tables, the base years weights for GDP(O) and GDP(E) would be different and meet the requirements for independence of the two series.
- We understand that previously published Input-Output tables are currently being revised to provide a consistent series of Input-Output data offering an opportunity to address the issue of base year weights.