

Monitoring Review

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Projections and forecasts as official statistics

Issue

Whether official projections and forecasts are being treated consistently in terms of which should be regarded as official statistics, and how should the Code of Practice for Official Statistics¹ be interpreted in this context.

1. The paper concludes that the current position, in which some sets of official projections are treated as official statistics and some are not, is largely a consequence of the statutory position in regard to labelling numerical data as 'official statistics'; and that while some general principles might be promoted, any further intervention by the Statistics Authority would need to be based on the merits of individual cases. Despite the desirability of a common approach, we saw little scope to promote rules that would, if followed, secure uniformity of practice across the many official bodies that produce statistical projections and forecasts. The Statistics Authority has published on its website a statement² about the circumstances in which it will recommend to Ministers that statistical data which are not currently treated as official statistics should be so treated in the future.
2. As one might expect, projections and forecasts, where these are produced, mostly relate to the future but it is worth also noting that sometimes projections are needed to make estimates for current periods ('nowcasts') or even the recent past – for example, the estimated tax revenue for the most recent tax year, which will remain unknown until all tax has been collected. Also, there are no hard and fast rules about what the different words mean. Statistical estimates relating to the future are variously, and sometimes inconsistently, referred to projections³, forecasts⁴ or predictions⁵.
3. Estimating future demand for services is an essential part of policy making and resource planning. Projections and forecasts of future demand, and of quantities that serve as proxies for demand – such as population – therefore play a vital role in the business of public administration. And their status in terms of whether or not they are identified as official statistics determines whether they are covered by the provisions of the *Statistics and Registration Service Act 2007*⁶. The Act provides both for a formal Code of Practice and for monitoring of compliance with that Code.

¹ <http://www.statisticsauthority.gov.uk/assessment/code-of-practice/code-of-practice-for-official-statistics.pdf>

² <http://www.statisticsauthority.gov.uk/news/management-information--mi--and-research-data-as-official-statistics.html>

³ <http://stats.oecd.org/glossary/detail.asp?ID=3806>

⁴ <http://stats.oecd.org/glossary/detail.asp?ID=3652>

⁵ <http://stats.oecd.org/glossary/detail.asp?ID=3792>

⁶ http://www.opsi.gov.uk/Acts/acts2007/pdf/ukpga_20070018_en.pdf

4. Projections and forecasts are thus used by a wide range of bodies to plan future services and to provide information to help develop policies. Population projections are used to plan the provision of services such as transport, hospitals and schools, and to develop policy relating to pensions and other state provisions. Household projections provide an important part of the evidence base for the assessment of future housing requirements, and so on.
5. The status under the legislation of projections and forecasts was identified as an issue in the Statistics Authority's Assessment Report on Income Tax Statistics⁷ produced by HM Revenue & Customs (HMRC). Income tax projections were excluded from the scope of that Assessment, at HMRC's request. Following the Authority's formal request⁸ to assess the projections (which implies that we wish to treat them as official statistics), the Exchequer Secretary to the Treasury agreed⁹ that the projections should be assessed, but noted concerns about treating them as official statistics.

The meaning of the words

6. Statisticians in the UK conventionally use the word 'projection' to mean the process of rolling forward past trends without constraining the results to reflect assumptions about the future impact of external factors, such as policy changes. Because this requires only examination of past data, it is seen as a proper form of statistical analysis of existing data. 'Forecasts' in contrast are free to take account of assumptions about the future and other constraints which go beyond what would normally be regarded as reproducible statistical analysis.
7. However, in practice this distinction between projections and forecasts does not seem to be applied consistently, either in the UK, or internationally. This is regrettable since there is a very important distinction between carrying out a statistical analysis of past data (which can be reproduced at any time by anyone who understands the methods used) and a forecast which makes assumptions about the future impact of policy changes and other external factors.
8. In most cases, it will be easier to demonstrate compliance with the *Code of Practice* for true projections than for forecasts (as defined above). Making assumptions about future policy impacts or interventions – or indeed the future impact of existing policy – would not normally be acceptable within the framework of the statistical *Code of Practice*. While the *Code of Practice* does not deal with this explicitly, we think that estimates that have this property should not be presented as official statistics and that this principle might be included in a future revision of the *Code*.

⁷ <http://www.statisticsauthority.gov.uk/assessment/assessment/assessment-reports/assessment-report-157---statistics-on-income-tax.pdf>

⁸ <http://www.statisticsauthority.gov.uk/reports---correspondence/correspondence/letter-from-sir-michael-scholar-to-david-gauke---s16-notification--03112011.pdf>

⁹ <http://www.statisticsauthority.gov.uk/reports---correspondence/correspondence/letter-from-david-gauke-mp-to-sir-michael-scholar---141211.pdf>

9. While 'projection' is often used to mean straightforward rolling forward of past trends there are many special cases. As the Office for National Statistics (ONS) says in the notes¹⁰ to its statistical release on population projections:

'The national population projections are based on ... a set of demographic assumptions about future fertility, mortality and migration based on analysis of trends and expert advice. ... The national population projections are not forecasts and do not attempt to predict the impact that future government policies, changing economic circumstances or other factors (whether in the UK or overseas) might have on demographic behaviour. They simply provide the population levels and age structure that would result if the underlying assumptions about future fertility, mortality and migration were to be realised.'

10. So despite the explicit statement that these are not forecasts, these projections involve some assumptions about the future based on 'expert advice' and are thus more than just the rolling forward of past trends. In some cases, 'variant' projections are produced. These are a form of sensitivity analysis, illustrating what the outcome might be under different scenarios – in effect different assumptions about the future. As described in the ONS notes, variant projections represent the projections arising from the use of:
'alternative, but still plausible, assumptions. These variant projections provide an indication of uncertainty by allowing users to consider the impact upon the population if future fertility, mortality and migration differ from the assumptions made for the principal projection. The publication of variant projections is an internationally recognised method for illustrating the uncertainty associated with population projections.'

11. 'Forecast' is used to describe various types of future estimate, based on approaches ranging from purely statistical models such as Holt-Winters (exponential smoothing) time series modelling and ARIMA modelling through to estimates made based on expert judgment. The Office for Budget Responsibility's (OBR) article about producing its economic forecasts¹¹ suggests some relevant points about the role of judgement in forecasting:

'Producing forecasts has never been solely a matter of cranking the handle of an econometric model. Models are an imperfect representation of the world. They are necessarily simplifications of reality. Forecasters are typically confronted with at least some key behavioural equations that do not explain the recent past well. The forecaster has first to try to identify the reasons for this, and then decide whether the unexplained element of behaviour – the equation 'residual' or 'error' – will stay the same, get bigger or get smaller.'

12. Existing practice would appear to indicate large grey areas regarding the classification of statistics about the future as either projections or forecasts. One consideration, as noted above, is the extent to which the statistics are based on the simple rolling forward of past trends, or whether they rely on judgment, particularly about the occurrence and impact of future (exogenous) events. Additionally, scenario (or "what if?") analyses such as variant population projections, sit squarely in the grey area as they roll forward previous data, but take into account judgments about the extent to which historic trends may be repeated in future. However, whether through loose labelling or otherwise, these distinctions do not appear to be consistently applied within the UK. Definitive classification is difficult as it would itself rely on a degree of judgment, for example about the amount of judgment involved in producing forecasts.

¹⁰ <http://www.ons.gov.uk/ons/rel/npp/national-population-projections/2010-based-projections/rep-2010-based-faq.html#tab-Generic-national-population-projections-FAQs>

¹¹ <http://budgetresponsibility.independent.gov.uk/pubs/Forecasting-the-economy.pdf>

Conclusions about enforcement

13. The points above illustrate that in practice, it would be unrealistic for the Statistics Authority to check that all estimates described as ‘projections’ really are objectively based on existing statistics and compiled in accordance with the *Code*. Or that those described as ‘forecasts’ do in fact make policy assumptions and are not simply labelled as forecasts to avoid the provisions of the *Code*.
14. However, it would be helpful if projections were more prominently identified as such within the portfolio of official statistics. An inventory of official projections and forecasts that are in the public domain would be one approach and could be of wide use to analysts.
15. In the light of these findings, we think that the Statistics Authority could promote – and ultimately seek to enforce – the principle that any projection labelled as ‘official statistics’ should be demonstrably based on the trends in past data, unconstrained by assumptions about the future or other constraints. And that forecasts which do involve such assumptions should only exceptionally be labelled as official statistics and where they are, the assumptions should be no more than absolutely necessary and fully documented alongside the release of the statistics.

Examples of Projections and Forecasts

16. Many producers of official statistics publish projections and forecasts. In one case that we identified, the projections are called ‘provisional estimates’. In addition, we understand that many projections and forecasts are compiled for use in developing policy, but remain unpublished. Some of the main published projections and forecasts are summarised here. More details are given in annex 1.

Labelled as projections

- Population projections
- Marital Status projections
- Household projections
- National Pupil projections
- Prison Population projections
- Income Tax Distributions and Liabilities
- Energy and Emissions Projections
- Distribution of Single Payment Subsidy Payments

Labelled as forecasts

- Preliminary estimates of GDP (components of)
- Capital Stocks (components of)
- Aviation Forecasts
- Road Transport Forecasts
- Farm Business Income Forecasts
- GDP Deflators
- National Non-Domestic Rate Collection Yield Forecast

Labelled as provisional estimates

- First Estimate of the Cereal and Oilseed Rape Harvest in Scotland

17. In the past, ONS published labour market projections¹². The OBR publishes a range of economic forecasts¹³, such as labour market forecasts¹⁴ and RPI inflation forecasts¹⁵ – though the OBR is not a producer of official statistics.
18. It is likely that other projections and forecasts are compiled by producers of official statistics, either unpublished, published as part of compendium publications, or feeding into other statistical series.
19. Projections or forecasts are necessary to develop policy in many areas. We think it likely that the list of outputs above is incomplete – both in terms of having identified all the projections and forecasts published by official statisticians, and of having covered all those projections and forecasts that have been compiled for use within producer bodies, but not published. Annex 2 lists some examples of projections and forecasts published by overseas National Statistics Institutes (NSIs). While being published by an NSI does not mean that they are regarded as official statistics, this serves to further highlight the wide range of topics for which projections and forecasts are considered useful.

Status as official statistics

20. The *National Statistician's* Guidance: Identifying Official Statistics¹⁶ is intended to be used as an aide to deciding whether 'quantitative information' should be classed as official statistics or not. However, it does not make explicit reference to statistics about the future.
21. Similarly the *Code of Practice* makes no specific reference to forecasts or projections. However, the following parts of the *Code* are relevant:
Principle 2, practice 2 and Principle 8, practice 2 require statistics to be presented impartially and objectively. To comply with this practice, assumptions made would need also to be objectively and openly described, and be seen not to be partial. This would be difficult where the method of compilation is based on assumptions about the occurrence, or not, of specific future events.

Principle 3, practices 2 and 3 require the relevant statistical Head of Profession to have sole responsibility for deciding on statistical methods, and for those producing statistics to be protected from pressures that might influence their production and presentation.

Principle 4, practice 1 requires that official statistics be produced according to 'scientific principles'. The use of scientific method implies the use of robust data and methods and of repeatability – that the same results would be produced by a different person using the same data.

¹² <http://www.ons.gov.uk/ons/rel/lms/labour-market-trends--discontinued-/volume-114--no--1/projections-of-the-uk-labour-force--2006-to-2020.pdf>

¹³ <http://budgetresponsibility.independent.gov.uk/category/topics/economic-forecasts/>

¹⁴ http://budgetresponsibility.independent.gov.uk/pubs/labour_market_forecasts_190810.pdf

¹⁵ http://budgetresponsibility.independent.gov.uk/pubs/rpix_inflation_forecasts_190810.pdf

¹⁶ <http://www.statisticsauthority.gov.uk/national-statistician/ns-reports--reviews-and-guidance/national-statistician-s-guidance/identifying-official-statistics.pdf>

In deciding assumptions to be made, including for example how far back in history to analyse data in order to ascertain a trend to roll forwards, some level of judgement will inevitably be needed. Such judgement should therefore be based on defensible evidence, including for example the use of sensitivity analysis to help determine appropriate assumptions. This practice also requires details of methods to be published, including an explanation of why particular choices have been made. Therefore, any assumptions made need to be well-reasoned, and fully documented.

Principle 4, practice 2 requires that statistics be produced to a level of quality that meets users' needs and that users are informed about the quality of the statistics. This requirement would apply equally to projections and forecasts. One partial (but important) measure of the quality of projections or statistical forecasts is to compare them with the 'actual' values, subsequently.

**Monitoring and Assessment Team
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Annex 1: Examples of Official Projections and Forecasts Published in the UK

Population Projections (ONS)

<http://www.ons.gov.uk/ons/rel/npp/national-population-projections/2010-based-projections/index.html>

ONS produces population projections for 25 (and in some cases, but not published with any prominence, up to 100) years ahead by country of the UK, age and sex. 'Principal' projections are produced based on the most plausible assumptions for fertility rates, life expectancy and net migration. For comparison, equivalent projections for other European Member States are also shown.

Variants (high, low) are also provided, along with some special cases. A group of experts agrees the assumptions to be made. ONS publishes details of the expert panel, the assumptions made individually by the panel members, and the average view that is used to produce the projections. Known changes to the law are taken into account, but not those policy changes that have yet to become law.

Population projections are also produced by the Welsh Government, National Records of Scotland (NRS) and the Northern Ireland Statistics and Research Agency (NISRA) using the same methods. In some cases these have been broken down to fine geographies, such as National Parks.

Marital Status Projections (ONS)

<http://www.ons.gov.uk/ons/rel/npp/marital-status-population-projections-for-england---wales/2008-based-marital-status-projections/index.html>

ONS publishes marital status projections by age and sex for England and Wales, for 25 years ahead. Assumptions about marriage, divorce and cohabitation rates are applied to ONS's principal population projections. Variants are produced for high/low marriage, divorce and cohabitation rates, each applied to principal population projections. Variant population projections not used in producing marital status projections.

Household Projections (Department for Communities and Local Government)

<https://www.gov.uk/government/organisations/department-for-communities-and-local-government/series/household-projections>

The Department for Communities and Local Government (DCLG) produces projections for 25 years ahead of the number of households by composition, age of the head of household and region. DCLG applies a single set of rates describing the composition of households to ONS's population projections (principal and variant) to give principal and variant household projections. DCLG's release includes a description of the nature of the assumptions made in producing the projections.

Similar projections are also published by the Welsh Government, NRS and NISRA.

National Pupil Projections (DfE) (Not National Statistics)

<http://www.education.gov.uk/researchandstatistics/datasets/a00211339/national-pupil-projections-july-2012>

DfE produces national pupil projections based on an age breakdown of ONS's population projections, combined with DfE's own data from the School Census and up-to-date information about births. DfE publishes projections by type of school for 7 years ahead, and by age and type of

school for 4 years ahead. DfE also describes the effects of using some of the variant assumptions used by ONS.

The Scottish Government previously published some projections separately, but now includes these as part of its suite of summary statistics about education.

Prison Population Projections (Ministry of Justice)

<http://www.justice.gov.uk/publications/statistics-and-data/prisons-and-probation/prison-population-projections-ns.htm>

The Ministry of Justice produces lower, medium and higher projections of the prison population for 6 years ahead. These are published by age, sex and type of prisoner. The most recent projections include separate projections of the number of people projected to be imprisoned as a result of the public disorder in the UK in summer 2011. No impact is taken of potential changes in legislation etc, but the projections do take into the impact of known events that have already occurred.

The Scottish Government and NISRA also produce equivalents that are official statistics.

Income Tax Liabilities (HM Revenue & Customs)

http://www.hmrc.gov.uk/stats/income_tax/liabilities-april2012.pdf

HM Revenue & Customs' income tax liabilities statistics include projections of a range of parameters related to income tax, for 3 years ahead. The projections are given broken down by marginal tax rate, country, sex, age, and income band. The projections use OBR's published economic forecasts as assumptions in order to estimate the number of tax-payers and their tax liability for recent, current and near-future tax years.

First Estimate of the Cereal and Oilseed Rape Harvest (Scottish Government)

<http://www.scotland.gov.uk/Resource/0040/00404539.pdf>

Because of the timing of Eurostat data requirements, and the end of harvesting in Scotland, the Scottish Government produces an early first estimate of the harvest based on incomplete data. The early estimates are needed to meet Eurostat's deadline for estimates of crop yields. The statistical bulletin explains:

"The provisional estimates are derived from yield values of individual growers collated by several industry bodies. These industry bodies meet to discuss and quality assure these estimates at the annual Crop Report Meeting."

The bulletin lists the organisations that are represented at the Crop Report Meeting.

Preliminary estimates of Gross Domestic Product (ONS)

<http://www.ons.gov.uk/ons/rel/gva/gross-domestic-product--preliminary-estimate/index.html>

ONS uses various forms of forecasts in producing its early estimates of GDP. ONS's early estimates of GDP(O) include less than complete 'actual' data. A 2005 paper¹⁷ explains that the first month's estimate of GDP(O) contains only around 44% 'actual' data, the first revision around 67% 'actual' data, and the second revision around 80%. It also explains that the missing components are assembled by various means including statistical forecasts derived from. In addition, some forecasts are based on expert judgment, incorporating data from secondary sources where

¹⁷ <http://www.ons.gov.uk/ons/rel/elmr/economic-trends--discontinued-/no--617--april-2005/early-estimates-of-gdp-information-content-and-forecasting-methods.pdf>

available. Where the forecast is made for a current period, based on previous periods, this activity is called nowcasting.

Provisional Estimates of Capital Stock (ONS)

<http://www.ons.gov.uk/ons/rel/cap-stock/capital-stock--capital-consumption-and-non-financial-balance-sheets/2010-results/capital-stocks--capital-consumption-and-non-financial-balance-sheets--2010.pdf>

ONS includes forecasts of capital stock in its published estimates, and in National Accounts. These are produced using Holt-Winters forecasting.

UK Aviation Forecasts (Department for Transport)

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/4503/uk-aviation-forecasts.pdf

The Department for Transport (DfT) publishes a range of forecasts of passenger demand and CO₂ emissions from the UK aviation industry for 40 years ahead. The extensive report includes vast details about the methods used to compile the forecasts, including ways that the quality of the forecasts is evaluated.

Road Transport Forecasts (DfT)

<http://assets.dft.gov.uk/publications/road-transport-forecasts-2011/road-transport-forecasts-2011-results.pdf>

DfT has published a range of road transport forecasts since the 1970s. Road transport demand is forecast along with estimates of congestion and journey times, and associated emissions. Forecasts are published for 25 years ahead. The report includes details about the assumptions made, and compares outcomes with previous forecasts as a measure of quality of the forecasts made.

Energy and Emissions Projections (Department of Energy & Climate Change)

http://www.decc.gov.uk/en/content/cms/about/ec_social_res/analytic_projs/en_emis_projs/en_emis_projs.aspx

The Department of Energy & Climate Change publishes Energy and Emissions Projections annually. They include projections for 25 years ahead of energy demand and the emission of greenhouse gases. The report includes comprehensive sections about the assumptions made in using the projections, and a description of the uncertainties around the projections.

Projections of Distribution of Single Payment Subsidy Payments (Department for Environment , Food and Rural Affairs)

<http://www.defra.gov.uk/statistics/files/defra-stats-foodfarm-envirob-research-sps-2012projections-feb07.pdf>

In 2007, the Department for Environment, Food and Rural Affairs (Defra) published an updated analysis of how the distribution of Single Payment Scheme (SPS) payments in England was expected to vary by farm type, size and region in 2012 compared with the position in 2004 before the introduction of the SPS. Results are shown by region, farm type and farm size. Little is presented about methods, or about the quality of the projections.

Farm Business Income Forecasts (Defra)

<http://www.defra.gov.uk/statistics/files/defra-stats-foodfarm-farmmanage-fbs-publications-fbincomes-statsnotice-120302.pdf>

Defra publishes forecasts (under the label 'provisional estimates') of Farm Business Income for the year ahead. These are based on information available early in the year for prices, animal populations, marketings, crop areas and yields. This statistical bulletin was included in Assessment Report 72 and is designated as National Statistics.

Forecast GDP Deflators (HM Treasury)

http://www.hm-treasury.gov.uk/data_gdp_index.htm

As part of presenting a GDP series back to the mid-1950s, HM Treasury also includes the latest forecasts for changes in GDP for 6 years into the future. These are consistent with those used in the Budget. Some general background material is presented, including some worked examples, but little of this relates to the forecasts.

National Non-Domestic Rates to be Collected by Local Authorities in England (DCLG)

<http://www.communities.gov.uk/documents/statistics/pdf/2149323.pdf>

DCLG publishes estimates of the non-domestic rates to be collected by local authorities in England. These include estimates for the most recent complete year (where rates collection will not yet be complete) and the current year based on rates levels, numbers of hereditaments and expected payment ratios. These are expressed as "budgets" to distinguish them from estimates of actuals.

Annex 2: Examples of Projections and Forecasts Published Internationally

Population

USA: <http://www.census.gov/population/projections/>

Sweden: http://www.scb.se/Pages/Product_____14507.aspx

Australia: <http://www.abs.gov.au/Ausstats/abs@.nsf/mf/3222.0>

NZ: http://www.stats.govt.nz/browse_for_stats/population/estimates_and_projections/subnational-population-projections-info-releases.aspx

Canada: <http://www.statcan.gc.ca/pub/91-520-x/91-520-x2010001-eng.htm>

Netherlands: <http://statline.cbs.nl/StatWeb/publication/?VW=T&DM=SLEN&PA=03766eng&LA=EN>

Labour Force

USA: <http://www.bls.gov/news.release/ecopro.toc.htm>

Sweden: http://www.scb.se/Pages/Product_____9962.aspx

Australia: <http://www.abs.gov.au/ausstats/abs@.nsf/PrimaryMainFeatures/6260.0>

NZ: http://www.stats.govt.nz/browse_for_stats/population/estimates_and_projections/national-labour-force-projections-info-releases.aspx

Canada: <http://www.statcan.gc.ca/pub/11-010-x/2011008/part-partie3-eng.htm>

Household/family

Australia: <http://www.abs.gov.au/ausstats/abs@.nsf/mf/3236.0>

NZ: http://www.stats.govt.nz/browse_for_stats/population/estimates_and_projections/subnational-family-and-household-projections-info-releases.aspx

Other examples

Education forecasts (USA): <http://nces.ed.gov/programs/projections/projections2020/>

Short-term economic forecasts (Italy): <http://www.istat.it/en/archive/32705>

Water extraction (Sweden):
http://www.scb.se/Pages/PublishingCalendarViewInfo_____259924.aspx?PublObjId=2117

Agriculture (USA): <http://www.ers.usda.gov/Publications/OCE121/OCE121.pdf>