Scottish
Fiscal
Commission

Forecast Evaluation Report
September 2018

Foreword

As Scotland's independent and official forecaster, the Commission has a duty not only to produce the forecasts used to inform the Scottish Government's Budget but also to evaluate those forecasts. We see evaluation as an essential part of performing our role. It allows us to learn lessons to improve our approaches, builds the confidence of our users in our approach, allows others to understand the likely accuracy of future forecasts, and can help to elicit feedback on our models and analysis.

This report fulfils our statutory obligation to evaluate our forecasts once per year and marks the first opportunity we have had to evaluate our own forecasts published in December 2017 and May 2018. Previously we evaluated the Scottish Government's forecasts, which we had assessed as reasonable in our non-statutory role.

Forecasting has inherent uncertainties. We look to past trends to inform our judgements on the future. The past, however, is an imperfect guide to the future with rapid changes in the global economy, society, politics and technology. Analytical models, based on historic data and theory, can help provide insight and guidance, but all have limitations. Forecasts cannot perfectly predict the future.

These uncertainties are an inescapable part of forecasting. However, given the importance of our forecasts in Scotland's finances, it is essential that we critically evaluate our previous forecasts and look for ways of improving them in the future. Our approach to forecasting is never static, it needs to evolve as the world around us changes. Forecasting is an on-going process of intelligence gathering, learning from previous forecasts, reflection and refinement.

Forecasting error can arise for a number of reasons. Only by properly understanding the reason for our forecast errors can we hope to improve our approach. Unexpected and unpredictable events can change the course of the economy, or our models may not correctly predict changing trends in taxpayer behaviour. In some instances, the available historic data can shift and significantly change our understanding of the economy or tax revenues. This has been the case in particular with our economy and income tax forecasts. The latest release of economic data from the Scottish Government has considerably revised historic data, and the first data covering outturn income tax receipts for Scotland for 2016-17 differ significantly from previous estimates.

We are committed to openness and transparency in all of our work. By being transparent in our forecasting, we hope to engage users in our approach to help improve our forecasts. This report is no different. We have tried to be as open as possible in critically evaluating our forecasts, and we hope this is apparent in the analysis below. All of the figures, charts and tables are available to download in workbooks. Where possible, we have also provided databases of our historic forecasts and the historic data, so that interested users can perform their own evaluations. If you have your own insights into our forecasting performance and where there is room for improvement, please don't hesitate to get in touch.

Dame Susan Rice DBE   Professor Alasdair Smith

Contents

Summary

1 This report contains detailed evaluations of our economy, income tax, Non-Domestic Rates (NDR), Land and Buildings Transactions Tax (LBTT) and Scottish Landfill Tax (SLfT) forecasts, published in December 2017 and May 2018. Where relevant we also include an evaluation of the Scottish Government's earlier forecasts which we assessed as reasonable. Below we summarise the main messages and lessons learned across these evaluations.

2 The extent to which we can evaluate forecasts varies, depending on how long we, or the Scottish Government, have been producing forecasts, and on the availability of outturn data. Over time, we will be able to evaluate our forecasts against more outturn data and be able to evaluate whether there have been any systemic forecasting errors.

3 Although availability of data limits what evaluation is possible in this report, nevertheless this exercise has generated valuable lessons and key messages:

- There are some aspects of our forecasts we might have done differently, but overall we believe the scale of forecast error in our forecasts is reasonable compared to other forecasters.

- Developments in outturn data can have a significant impact on our understanding of the economy and taxes, including revisions to historic data. In future, we will seek to assess any mitigating actions we can take to control for revisions to outturn data where there are known issues. We will communicate with our forecast users when we think major revisions are likely, and the potential impact of this on our forecasts.

- The further ahead we look, the more uncertain the future. The scale of forecast error generally increases for forecasts further in the future.

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- In some cases, before powers are devolved there is uncertainty as to the level of receipts or spending in Scotland. This creates additional uncertainties until a baseline level of revenue or spending is developed. In the case of income tax, the release of the first baseline receipts data will improve the accuracy of future forecasts.

4   Most of the SFC forecasts evaluated in this report are made within the financial year that they are forecasting. We call these in-year forecasts. We also produce forecasts for one year ahead and longer periods. Our evaluation report next year will provide the first opportunity to evaluate some of our one-year ahead forecasts for 2018-19 made in December 2017. We have included comparisons to the forecast errors made by other organisations, but these should not be considered directly comparable because of the timings of the forecasts and differences in availability, quality and timeliness of data available to each organisation.

5   Alongside this report we are publishing our first annual Statement of Data Needs.[1] As shown throughout this report, good data are critical to both creating our forecasts and evaluating them. Our role and our approach to forecasting continue to evolve, and so our data needs continue to change over time. This is reflected in our Statement of Data Needs, in which we set out a number of requests to those who supply us with data including the Scottish Government, HMRC, Revenue Scotland and DWP.

Evaluations in this report

6   The table below shows the forecasts which are evaluated in this report

Table 1: Evaluations included in this report

Forecast subject	Period covered by forecast being evaluated	Forecast producer	Date forecasts produced	Most recent outturn data period
Economy	2017-18	SFC	December 2017 May 2018	2017-18
Income tax	2016-17	SG SFC	February 2017 December 2017[2] May 2018	2016-17

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[1] Scottish Fiscal Commission (2018) Statement of Data Needs September 2018 (link)

[2] We also produced an updated income tax forecast in February 2018, this reflected changes in the Scottish Government's income tax policy from 2018 onwards and did not affect our forecasts of receipts in 2016-17.

NDR	2017-18	SFC	December 2017 May 2018	2017-18
LBTT	2017-18	SG SFC	December 2016 December 2017 May 2018	2017-18
SLfT	2017-18	SG SFC	December 2016 December 2017 May 2018	2017-18

7   For income tax, a full evaluation of our 2017-18 forecasts cannot take place until after the outturn data are published next year so our evaluation focuses on the impact of the new outturn data published for 2016-17.

8   We have not evaluated our forecasts of the Scottish share of Air Passenger Duty (APD) produced in December 2017 because there are no Scottish outturn data available, as the tax is collected on a UK-wide basis.

9   We produced our first forecasts of social security spending in December 2017, and including in-year estimates for 2017-18 spending. We are not evaluating those forecasts in this report because we do not have adequate data for a meaningful evaluation. The lack of data is due, in part, to DWP outturn data not being available until the expenditure by country and region tables are published later in September, and the Social Fund Annual Report is published in the autumn. Future reports will include evaluations of our social security forecasts. We are continuing to develop our work on social security, and on 19 September 2018 we will publish a paper describing our approach to forecasting social security expenditure.

Economy

10   Overall, our GDP forecast error is within what we believe is a reasonable range based on the track record of the OBR forecasting the UK economy. In May 2018 we forecast GDP growth in 2017-18 of 0.7 per cent, this compares to the latest data release showing growth of 1.3 per cent. Our forecast error of 0.55 percentage points was slightly greater than the OBR's average GDP forecast error of 0.42 points, but close to the OBR average when considering the typical variation of the OBR's forecast error. Looking in more depth at our economy forecast, our forecast of employment appears particularly accurate.

11   The publication of Quarterly National Accounts Scotland (QNAS) data in August 2018 included significant revisions to historic GDP growth. This is primarily because of revisions to data on construction industry activity since 2015. GDP growth in 2017-18 was revised up by 0.5 percentage points, from

0.8 per cent to 1.3 per cent. This is an exceptionally large revision by historic standards – around five times what is typically the size of revision to annual GDP growth between publications.

12   Before this revision, the data showed the construction industry shrinking by 12 per cent from a peak in 2015 to the latest period. In our previous reports we discussed the impact on the economy of volatility in the construction industry. We noted the possibility that this volatility was the result of problems in the measurement of construction industry activity, and that we would have to continue to monitor the data closely. We anticipated that revisions were likely at some point, though we made a judgement that it was not possible to pinpoint the exact scale, direction and timing of these revisions.

13   The latest data now show the construction industry growing by 4 per cent since 2015, rather than falling by 12 per cent. This is a significant revision and affects estimates of GDP growth. The scale of this revision was a large contributing factor in our in-year GDP forecasting error of 0.55 percentage points for 2017-18.

14   When we produced our May 2018 forecast report, we already had three quarters of official GDP outturn data for 2017-18. These outturn data were then significantly revised. In order to have correctly forecast 2017-18, we would have had to create our own divergent estimates of economic activity in 2017-18. While we were conscious that revisions to the construction series could lead to revisions in GDP, we took the decision to not make explicit adjustments to our short run modelling. This decision was based on the view that the then official estimates produced by the Scottish Government statisticians were the best current estimates of activity.

15   Looking beyond 2017-18, our previous forecasts included a subdued outlook for economic growth. Although the QNAS revisions have a significant impact on the historic year-on-year GDP growth estimates, they do not change the underlying picture of the Scottish economy as the upward revisions to growth in 2017-18 are more than offset by other revisions in earlier years. Overall, we do not anticipate that the revised GDP data will significantly alter our medium- to long-run view of the Scottish economy when it comes to our next forecasts. We had already controlled for the volatility in construction industry data in our longer-term modelling of the economy. The QNAS revisions have actually resulted in average GDP growth since 2010-11 being revised down, from 1.2 per cent at the time of our May 2018 forecast to 1.1 per cent, as shown in Figure 1.

Figure 1: GDP growth data available at time of May 2018 forecast and revised GDP growth 2010-11 to 2017-18, per cent growth
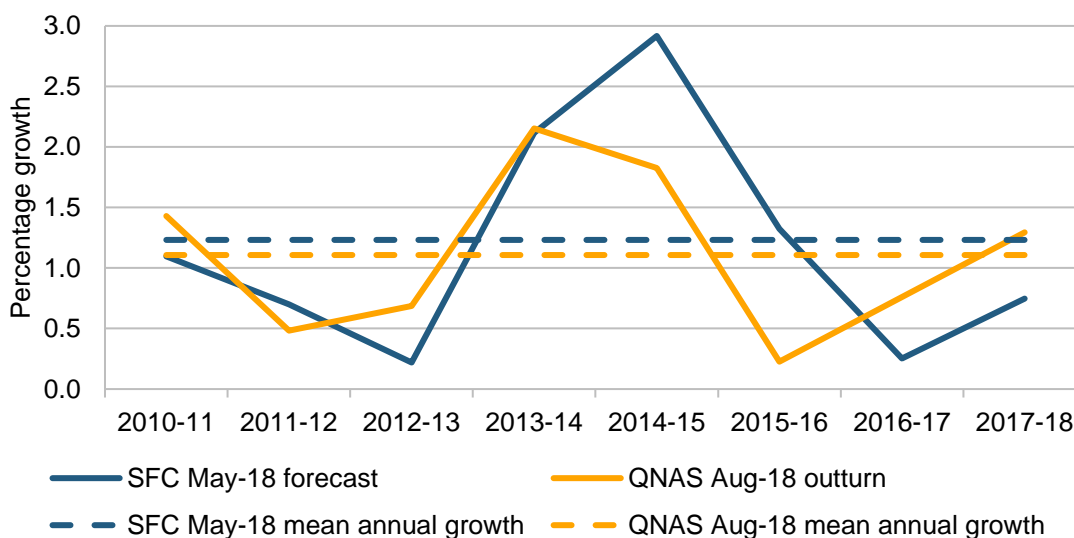
Source: Scottish Fiscal Commission, Scottish Government (2018) Quarterly National Accounts Scotland, 2018 Quarter 1 (link)

16   In future, we will enhance our communication of the likely impact of revisions on our forecasts and discuss the risks these pose to our forecasts.

Income Tax

17   On 12 July 2018 HMRC published its first outturn data on income tax liabilities in Scotland, covering the year 2016-17. For the first time, this was based on full administrative data using Scottish taxpayer codes.

18   When we produced our May 2018 forecasts, the Survey of Personal Incomes (SPI) for 2015-16 was the best available source of information on income tax liabilities in Scotland. The SPI is a sample of UK administrative data held by HMRC with the identification of Scottish taxpayers based on postcodes held by HMRC. Our forecasts are based on the Public Use Tape (PUT), an anonymised and publically available version of the SPI. The newly available outturn data are created in a different way from the SPI and the PUT, following a Scottish taxpayer identification exercise carried out by HMRC.

19   When we published our May forecast, we highlighted that we anticipated a number of significant underlying differences between our 2015-16 PUT-based estimate of income tax liabilities in 2016-17 and those that would be published by HMRC using outturn data. At the time, there was insufficient information to predict the likely magnitude or direction of this difference.

20   The HMRC outturn data show liabilities of £10.7 billion in 2016-17 compared to our estimate in May of £11.3 billion.

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21   The new HMRC outturn data are now the primary estimate of income tax liabilities in Scotland. While the differences between these data and the PUT will not be known until HMRC produce the 2016-17 PUT next year, the data release appears to show the PUT has overestimated income tax liabilities and this is the main explanation of our income tax forecast error of £550 million. Figure 2 shows the previously available PUT data, our forecast for 2016-17 and then outturn data.

Figure 2: Scottish non-savings non-dividend income tax liabilities, estimates and outturn data
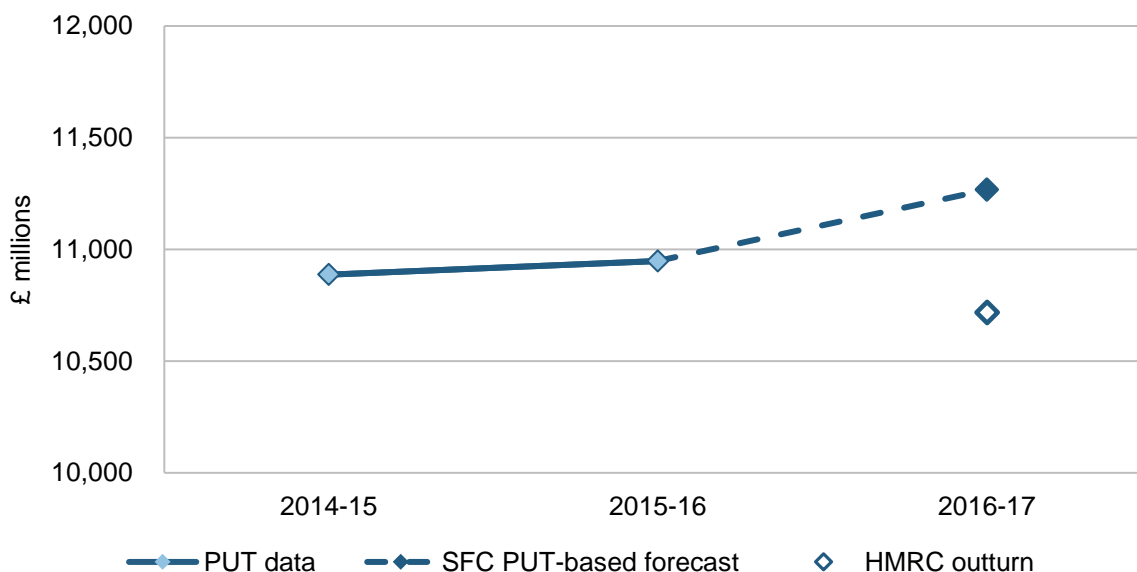
Source: HMRC outturn data supplied to Scottish Fiscal Commission, Scottish Fiscal Commission
Notes to table: We use the publically available version of HMRC's SPI called the Public Use Tape (PUT).

22   In May, we estimated income tax liabilities of £11.3 billion in 2016-17. The new outturn data show liabilities of £10.7 billion, a difference of £550 million, or 5.1 per cent.[3] This was a greater forecast error than the benchmark Office for Budget Responsibility's (OBR) average UK income tax forecasting error we have calculated.

23   We believe most of this headline error of £550 million is because of data issues. Differences in the estimated number of taxpayers with higher levels of income between the PUT and outturn data appears to contribute a significant amount to the total error, in particular differences in the number of additional rate taxpayers. Our analysis suggests that around £500 million of the £550 million error could be due to differences in the number of taxpayers between the two data sources.

24   We do not believe it would have been possible to predict the difference between the PUT and the outturn data in advance of its publication. As with revisions to economic data, we will continue to make clear to our users when

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[3] Note numbers may not sum because of rounding.

we think there are weaknesses in data underpinning our forecast and how this may affect our forecast accuracy.

25 Now that we have outturn data for the first time, we will explore options for how best to adjust our forecasts to this new information and present a new approach in the next forecasts. By calibrating our forecasts to this new information, our future forecasts are less likely to be subject to such large errors caused by underlying data differences.

Non-Domestic Rates (NDR)

26 Our December 2017 forecast for NDR income of £2.8 billion in 2017-18 produced a 1.8 per cent (or £50 million) overestimate of revenue raised. £38 million of this error can be attributed to our forecast for gross NDR income, the tax due before accounting for reliefs. The remaining £12 million is attributable to an under-forecast of mandatory reliefs claimed. The forecast error was comparable in size to typical in-year forecast errors made by the OBR and the Scottish Government.

27 In evaluating the gross income forecast error, we are only able to assess the contribution of growth in the tax base (also known as buoyancy), given the data available to us. Buoyancy contributed 35 per cent, or £13 million of the £38 million overestimate of gross income in 2017-18, and 27 per cent of the total NDR overestimate. The main reason for this overestimate was that our projections of growth in the tax base were based on long-term average growth, which included pre-crisis data of lesser quality. Therefore for our May 2018 forecast we updated our approach, instead basing our projections on more recent and complete data. If we had used this approach in December our forecast error would have been £8 million lower.

28 The major drivers of our forecast error attributable to mandatory reliefs were higher than expected expenditure on Empty Property Relief (£15 million) and Charitable Rate Relief (£4 million). This was somewhat balanced out by lower than expected expenditure on Transitional Relief (£7 million). The forecast error for Empty Property Relief highlights what is likely to be a persistent source of error in our forecast. There is no easily predictable trend for the amount of relief claimed. This can in part be attributed to the frequency with which the criteria for and administration of the relief are changed.

Land and Building Transaction Tax (LBTT)

29 Our December 2017 forecast for total LBTT of £557 million was an overestimate of £0.2 million against the provisional outturn data for 2017-18 released by Revenue Scotland; this was a 0.0 per cent forecast error. However individually there were larger errors in the forecasts for each component of the tax, but these errors cancelled one another out. The major components were a 5 per cent overestimate for residential LBTT, a 2 per cent underestimate for Additional Dwelling Supplement (ADS) and a 5 per cent underestimate for non-residential LBTT. In our May 2018 forecast, the

errors for residential and non-residential LBTT forecasts for 2017-18 were lower, but our overall forecast error increased to 1 per cent. All of our forecast errors were comparable in scale to the equivalent forecasts from the Office for Budget Responsibility (OBR).

30   Our December 2017 residential LBTT forecast included an expectation that transactions would increase during this period. This proved to be the main source of the £13 million overestimate in revenue raised. Following increases in property sales in the first six months in 2017-18, the Scottish housing market saw a fall of 1,780 transactions in the second half of the financial year, when compared with the same period of the year before. This was driven by transactions with a value of £250,000 and under, which made up 81 per cent of transactions.

31   Our Additional Dwelling Supplement (ADS) December 2017 forecast produced a £2 million underestimate. As the ADS forecast is linked to our residential LBTT model, our overestimate of transactions was again a source of error. This would have led to an overestimate of ADS revenue, but for our projection that 30 per cent of ADS paid would be reclaimed after 18 months. This proved to be too high an estimate, which resulted in our forecast underestimating ADS. We reduced the assumed repayment rate in our May 2018 forecasts.

32   For our non-residential LBTT forecast, the £11 million underestimate was due a higher proportion of revenue being raised in the second half of the financial year than in the first two years of the tax's existence. We have developed the non-residential model considerably since December 2017 and as of our May 2018 forecast, our approach is based entirely on Scotland-specific data on revenues, transactions and prices.

Scottish Landfill Tax (SLfT)

33   Our December 2017 forecast for SLfT was £11 million, or eight per cent, lower than the provisional outturn released by Revenue Scotland of £148 million in 2017-18. The in-year forecast was created by scaling up the first quarter of outturn data available at the time which led to an underestimate of the level of waste landfilled and therefore tax receipts.

Conclusion

34   Whilst most of our forecasts have been within the historic range of accuracy of equivalent forecasters, we must emphasise that forecasts of the economy and tax revenue can never be completely accurate and that some error should always be expected. By evaluating our forecasts against outturn data, and sharing that analysis for public critique in this report, we hope to improve our analytical modelling and our judgements. However the largest of the forecast errors evaluated here are because of new or revised data becoming available. This illustrates how data quality and availability are critical to our

ability to produce accurate forecasts, and we welcome the new data sources that are becoming available to us.

35   The main actions we will take as a result of the evaluations in this report are: to revise our modelling of income tax taking account of the new outturn data; to assess whether mitigating actions can be taken when we know of likely data issues; to ensure we give users of our forecasts more detail about how data issues may affect our forecasts; and where necessary to seek improvements in data quality or availability.

36   Finally, we recognise the limitations of the evaluation possible with less than one year of forecasts. Looking to the future, we will be able to produce more detailed evaluations as the Commission produces more forecasts and more outturn data become available.

37   We do welcome constructive feedback to help us improve our work, so if you have suggestions or comments about our approaches to forecasting, or our approach to evaluation, please do contact us at info@fiscalcommission.scot.

Chapter 1
Introduction

1.1 This report provides an evaluation of the Commission's recent forecasts. We have so far published two sets of forecasts, one in December 2017 and one in May 2018. Given that our forecasting history is still less than one year, there are a limited amount of outturn data to compare our forecasts against at this time. We have therefore provided what evaluation we can, and this varies substantially from area to area. Over time, as the Commission produces further forecasts, and there are more outturn data available to compare these to, the scope and scale of our evaluation will grow.

1.2 This report evaluates our economy and tax forecasts, and where relevant the forecasts previously produced by the Scottish Government which the Commission, in its former non-statutory role, assessed as reasonable. The scope of our evaluation also varies based on the data available. While for most taxes we now have outturn data for 2017-18, income tax data is only available up to 2016-17.

1.3 We produced our first forecasts of social security spending in December 2017, and this included in-year estimates for 2017-18 spending. We are not evaluating those forecasts in this report because we do not have the data for a meaningful evaluation. The lack of data is due, in part, to DWP outturn data not being available until the expenditure by country and region tables are published later in September and the Social Fund Annual Report is published in the autumn. Future Commission reports will include evaluations of our social security forecasts. We are continuing to develop our work on social security and, on 19 September, we will publish a paper describing our approach to forecasting social security expenditure.

Limitations of forecasting

1.4 The past is an imperfect guide to the future with rapid changes in the global economy, society, politics and technology. Analytical models, based on historic data and theory, can help provide some insight into how the economy and public sector finances may change over time, but all have limitations. Forecasts cannot perfectly predict the future – the Commission's forecasts aim to present a balanced pathway through a broad range of possible outcomes.

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1.5   Forecasting is an on-going process of intelligence gathering, learning from previous forecasts, reflection and refinement. Judgements will be made based on the best evidence and intelligence available at the time of publication, but may change from one forecast to the next as the economy evolves and our understanding develops along with it.

1.6   Given the challenges of forecasting, a degree of forecast error is virtually inevitable. There is always potential for the future to unfold in unexpected ways. This is certainly the experience of other forecasting organisations with a longer track record of forecasting than the Commission. Box 1.1 discusses the OBR's history of forecast evaluation and some of their key lessons learned.

Box 1.1: OBR Forecasting – uncertainties and challenges

The Office for Budget Responsibility (OBR) is the UK Independent Fiscal Institution (IFI), established in 2010. At least twice a year they provide a detailed central forecast for the economy and the public finances. These forecasts are designed to provide a transparent benchmark against which to judge the significance of new economic and fiscal data, and against which to estimate and explain the likely impact of policy decisions.

The OBR emphasises in every Economic and Fiscal Outlook[4] and its own evaluation reports that since the future can never be known with precision, all such forecasts are necessarily surrounded by uncertainty. The OBR highlights that "the likelihood that any given forecast will turn out to be accurate in all respects is essentially negligible".[5]

The OBR has been evaluating its forecasts for several years. In their reports the OBR focuses on the last two years of forecasts, in order to give both a wider view of forecast performance and to account for any data revisions. The OBR accounts for international trends, in order to make a comparison of UK performance to other countries, and to isolate UK-specific trends. The OBR also analyses their forecasts at the most disaggregated level possible in order to account for potential bias because of, for example, errors when modelling one area of the economy, which may feed into other forecasts.

A key lesson learned by the OBR includes the need to make one's modelling assumptions clear when presenting forecasts. The OBR notes that "it is not the forecast model that determines the shape of the forecast it produces; it is the assumptions and judgements that are fed into it by the forecaster".[6] Only by being explicit in your judgements can you later evaluate them.

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[4] OBR (2018) Economic and Fiscal Outlook, March 2018 (link)

[5] OBR (2017) Forecast Evaluation Report, October 2017 (link)

[6] OBR (2016) Forecast Evaluation Report, October 2016 (link)

1.7   Alongside this report we are publishing our first annual Statement of Data Needs. As shown throughout this report, good data are critical to both creating our forecasts and evaluating them. Our role and our approach to forecasting continue to evolve, and so our data needs continue to change over time. This is reflected in our Statement of Data Needs, where we set out a number of asks to those who supply us with data including the Scottish Government, HMRC, Revenue Scotland and DWP.

What is forecast error?

1.8   When we discuss forecast error, we simply mean the difference between our forecast and what actually happened. Error does not necessarily mean a mistake was made. Sometimes, good forecasts can be knocked off course by unexpected events, such as severe weather. Equally, it is possible that a forecast that fails to fully utilise all available information turns out to be accurate due a number of offsetting changes. Any one forecast could turn out to be right or wrong in a number of ways. Our aim is that, over the longer-term, we can reduce our average forecast error by learning lessons from previous forecasts.

1.9   To learn lessons from evaluating our forecasts, it is important to correctly identify the factors causing forecast error. Only then can you consider how to improve your approach. There are many reasons forecasts may differ from outturn, including:

- **Data errors:** Sometimes, the data on which we base our forecasts is revised, or new data are released that were not previously available, and this can change our understanding of the economy or a tax. Had the new or revised data been available when we made our forecast, our forecast would have been different.

- **Modelling errors:** We rely on a large number of models to create our forecasts. These generally rely on identifying trends in historical data, and then predicting how these trends will change over time using a combination of the historical patterns and some theory. Sometimes, we may incorrectly identify historical trends, or misjudge how a trend might change in the future.

- **Incorrect judgements:** Forecasting relies on a large number of judgements to be taken. This is often done when there is limited information or evidence on which to base a forecasting decision.

- **Misunderstanding the impact of a known upcoming event:** There are certain events that we know will happen in the future that will affect our forecasts, with Brexit a prime example. We have to use a mixture of modelling and judgement to control for these events, but

may still incorrectly predict the impact that the event will have on our forecasts and this would lead to error in our forecast.

- **Unexpected events:** Distinct from the above category, some events simply cannot be predicted in advance in our forecasts, and we cannot control for them. This may include unexpected severe weather events, natural disasters, or global political crises. Similarly the Government may announce new policies after a given forecast was published.

- **Analytical mistakes and human error:** Some of our models and forecasting approaches are complicated. While we see simplicity as an asset in our models, some are necessarily large and complicated, such as our income tax model which projects income tax records of thousands of individual taxpayers. With such large models, mistakes and human error are always possible. For example, coding errors, mistypes or incorrect cell referencing. We have quality assurance processes in place to minimise such errors and we have a process for reporting when such errors are discovered.[7]

1.10   Different categories of error require different actions to minimise the error in the future. For example, if we see that our error is because of modelling error, we would have to look at improving the way our models work. If on the other hand the error was because of analytical mistakes, we would review and improve our internal quality assurance processes.

1.11   In some cases, particularly where our forecast error is because of fundamentally unpredictable changes, such as unexpected events, the actions we can take to reduce our forecast error are limited. In these cases, we can help our users by trying to communicate the extent to which we may expect forecast errors in the future.

1.12   In this report, where possible, we have tried to understand which categories have contributed to our forecast errors. By doing so, we can start to identify what actions need to be taken to reduce our forecast error in the future. In reality, our forecast errors will be due to several of these categories of error, they overlap, and we may not always be able to explicitly identify the extent to which each kind of error has contributed to our overall forecast error. Even still, identifying the source of forecast error is an important first step in making improvements in the future.

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[7] Scottish Fiscal Commission (2018) Compliance with the Code of Practice for Official Statistics (link), see approach to corrections and revisions.

Approach to evaluation

1.13 In this report we seek to assess the accuracy of our forecasts. This can be done in a number of ways.

1.14 Forecast error is simply the difference between a forecast and outturn data. Equations 1 and 2 show how we calculate forecast error and relative forecast error.

Equation 1: Forecast error

$$\text{Error} = \text{Forecast} - \text{Outturn}$$

Equation 2: Relative forecast error

$$\text{Error} = (\text{Forecast} - \text{Outturn}) / \text{Outturn}$$

1.15 A positive forecast error means that our forecast over-estimated the outturn data, while a negative forecast error means our forecast under-estimated the outturn data. Relative forecast error is the percentage difference between our forecast and the outturn data.

1.16 Typically, we compare the forecast error of our recent forecasts to historical forecast error. This provides an indication of how our current forecasts have performed relative to historic performance.

1.17 As the Commission does not have a history of forecasting against which to compare our recent forecasts, we use OBR forecast error as an initial benchmark.

1.18 There are a number of ways of measuring typical historic forecast error:

- **Average error:** This simply averages together historic errors. With this measure, positive error cancels out negative error. For example, a forecast with errors of +0.5 per cent and -0.5 per cent would have an average error of 0.0 per cent. This provides an indication of the statistical bias of a forecast.

- **Average absolute error:** The absolute value, or magnitude, of all errors are averaged together. This provides an indication of the typical size of error of a forecast. A forecast with errors of +0.5 per cent and -0.5 per cent would have an average absolute error of 0.5 per cent.

1.19 In this report, where possible, we compare our recent forecasts to the average error and average absolute error from comparable OBR forecasts.

1.20 Once the headline forecast error has been presented, we try to present some breakdowns of that error so that the source of the error can be better understood. Each evaluation section then concludes with lessons learned for the future.

Background to the Commission

1.21   In April 2017 the Scottish Fiscal Commission became responsible for producing independent economic and fiscal forecasts to inform the Scottish Budget.

1.22   The Commission produces independent forecasts of:

- revenue from fully devolved taxes

- non-savings non-dividend income tax receipts

- onshore Gross Domestic Product (GDP) in Scotland

- devolved social security expenditure[8]

1.23   In the future the Commission will also produce forecasts of Scottish VAT receipts.

1.24   The Commission will produce forecasts at least twice a year. We also produce annual Forecast Evaluation Reports, and will from time to time publish working papers on related subjects.

1.25   The Scottish Fiscal Commission is structurally and operationally independent of the Scottish Government. More details about the remit and history of the Commission, including previous publications, can be found on our website: www.fiscalcommission.scot.

1.26   The Commission was previously a non-statutory body, established in 2014 to scrutinise Scottish Government forecasts of devolved taxes following the Scotland Act 2012. In December 2016, the Commission found the Scottish Government's forecasts of non-savings non-dividend Income Tax, Land and Buildings Transaction Tax and Scottish Landfill Tax to be reasonable. We also had a role in scrutinising the buoyancy and inflation elements of the Non-Domestic Rates forecast, which we also found to be reasonable.[9]

Box 1.2: Commission Forecasts and the Fiscal Framework

The Scottish Fiscal Commission's forecasts are an important component in determining the total budget that is available to the Scottish Government to spend in each fiscal year. However, they are not the only relevant forecasts.

The diagram below is a stylised representation of the way the Scottish Budget is determined. The forecast block grant adjustments (BGAs) are based on OBR forecasts of UK Government receipts of corresponding taxes, not on the OBR's

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[8] The Commission's specific role in social security forecasting is defined in the Scottish Fiscal Commission (Modification of Functions) Regulations 2017 (link)

[9] Scottish Fiscal Commission (2016) non-statutory Report of Draft Budget 2017-18 (link)

forecasts of Scottish taxes. These UK Government receipts forecasts are then used by the UK and Scottish Governments to calculate the BGAs, in which process the OBR and the Commission have no involvement.

Figure 1.2 How is the Scottish Budget Determined?
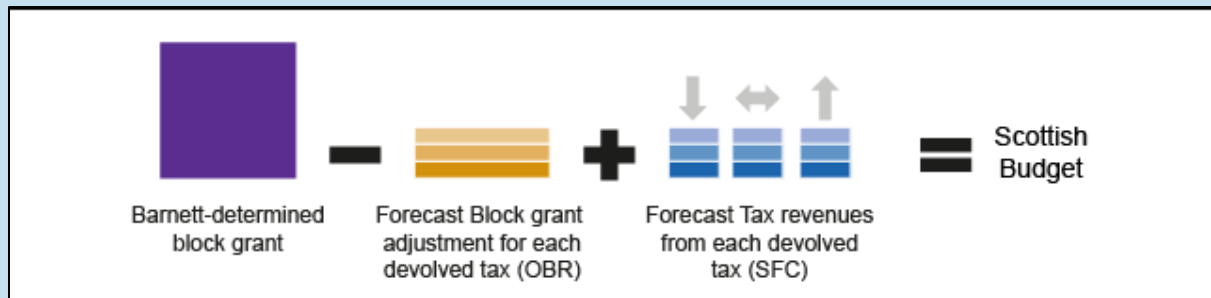
Source: SPICe Briefing (2017) UK Autumn Budget 2017 – impact on Scotland (link)

Professional Standards

1.27　The Commission is committed to fulfilling our role as an Independent Fiscal Institution (IFI), in line with the principles set out by the Organisation for Economic Cooperation and Development (OECD) for these institutions.[10]

1.28　The Commission also seeks to adhere to the highest standards for analysis possible. While we do not produce official statistics, as we produce forecasts, the Commission and our work voluntarily comply as much as possible with the principles of the Code of Practice for Statistics.

1.29　The Commission has published a statement on our compliance with the Code of Practice for Statistics on our website.[11] This sets out how the Commission demonstrates voluntary compliance with as many parts of the Code as possible.

Comments & Contact

1.30　We welcome comments from users about the content and format of our publications. In particular, if there are particular analyses, or disaggregation of data, which users would find useful as part of future reports, please let us know.

1.31　All charts and tables in this publication have also been made available in spreadsheet form on our website.[12] If you have any feedback, or would like to request further information about any of our analysis, please email info@fiscalcommission.scot or see the list of named contacts at the back of this publication.

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[10] OCED Recommendation on Principles for Independent Fiscal Institutions (link)

[11] Scottish Fiscal Commission (2018) Compliance with the Code of Practice for Official Statistics (link)

[12] Scottish Fiscal Commission (2018) Scotland's Economic and Fiscal Forecasts May 2018 (link)

Chapter 2 Economy

Introduction

2.1   This chapter contains the Commission's first evaluation of its economy forecasts. The error in our economy forecast compares reasonably well with our selected OBR benchmarks. Our in-year GDP forecasting error was slightly greater than the average but well within the range of typical OBR GDP forecast errors, while our forecast of employment compares favourably.

2.2   The largest contributing factor to our forecast error was revisions to economic data as published in the latest Quarterly National Accounts Scotland (QNAS) data in August 2018.[13] Between June and August 2018, the Scottish Government's estimate of economic growth in Scotland in 2017-18 was revised up from 0.8 per cent to 1.3 per cent. This was primarily because of revisions to estimates of construction industry activity.

2.3   In our previous reports we discussed the impact on the economy of volatility in the construction industry.[14] We identified that the statistics themselves - the measurement of construction industry activity – was a potential source of this volatility, and that we would have to continue to closely monitor the construction industry.

2.4   While we anticipated that GDP revisions were likely, predicting the exact impact of revisions is challenging, and to an extent incompatible with the way the Commission produces its economy forecasts.

2.5   When we produced our May 2018 forecast report, we already had three quarters of official outturn data for 2017-18. These outturn data were then considerably revised. In order to have correctly forecast GDP in 2017-18, we would have had to create our own divergent estimates of economic activity in

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[13] Scottish Government (2018) Quarterly National Accounts Scotland, 2018 Quarter 1 (link)

[14] See for example Scottish Fiscal Commission (2017) Scotland's Economic and Fiscal Forecasts December 2017 (link) paragraphs 2.43 to 2.47

2017-18. While we were conscious that revisions to the construction industry could lead to GDP revisions, we took the decision not to make explicit adjustments to our short run modelling. This decision was based on the view that the then official estimates produced by the Scottish Government statisticians were the best current estimates of activity.

2.6   Looking beyond 2018-19, our previous forecasts included a subdued outlook for economic growth. The revisions published in QNAS are unlikely to significantly change this view. We had already controlled for the volatility in construction data in our longer-term modelling of the economy. In addition, looking at the revised long run of Scottish GDP data since 2010-11, average GDP growth as estimated by the Scottish Government has actually been revised down, from 1.2 per cent to 1.1 per cent.

2.7   In this chapter we discuss in depth the impact of revisions to economic data and what this means for our forecasts. It is challenging to provide further in-depth evaluation of our forecasts at this time as the exceptionally large revisions to outturn data dominates our forecast error.

Approach to Economy forecast evaluation

2.8   As we have only been producing economy forecasts since December 2017, there is limited overlap between our forecasts and available outturn data against which to evaluate these forecasts.

2.9   At the time of producing our two forecasts, we had partial outturn data for 2017-18. At the time of our May 2018 forecast, we had GDP data covering the first three quarters of 2017-18, with the final quarter of data yet to be published. We now have full year estimates for 2017-18 for most variables.

2.10   In this section we evaluate the accuracy of our in-year economy forecasts, that is, how accurate we were at estimating the whole financial year given that we already had partial data for that year. In future evaluation reports, we will extend our evaluation to longer time horizons, looking at our accuracy at one, two, or more years ahead.

2.11   Forecasting the economy in-year, even with partial data available, still presents considerable challenges. Particularly for GDP and its sub-components, these data can be subject to significant revision after the first publication. Our in-year forecast error is not only a result of error in our prediction of the missing quarters of the year, but also the impact of revisions to the quarters for which we already had data.

2.12   Forecasts could be evaluated against the first release of new data following publication, or against the latest data available at the time of evaluation. In this report, we evaluate our forecasts against the latest available outturn

data, including any revisions to the historic data on which the forecast was based. This means that the error in our forecasts could change over time as outturn data get revised.

2.13   The OBR has been forecasting the UK economy since 2010.[15] To provide context for our evaluation we compare the accuracy of our forecasts to the average accuracy of the OBR's economy forecasts over the last eight years. While this comparison is imperfect for a number of reasons, we aim to compare our forecast errors on a like-for-like basis with the OBR's as much as possible. In this section we compare our in-year forecast errors for the Scottish economy to the OBRs in-year forecast errors for the UK economy.

2.14   The Commission is committed to transparency in its work. Alongside this report and future evaluation reports, we will provide a database containing a full historic back-series of each of our economy forecasts and all vintages of relevant outturn data. This will allow our users to create easily their own evaluations of our forecasts.

2.15   The economy forecasts are created for two reasons:

- To fulfil the Commission's remit of providing quarterly onshore Gross Domestic Product (GDP) growth forecasts for the next two years and annual growth forecasts for the subsequent four financial years

- To provide the economic variables that feed into the Commission's fiscal forecasts, for example: wages, employment and hours worked that are used in the income tax forecast.

2.16   In this evaluation we will focus on our headline forecasts of GDP, and the key determinants used in our fiscal forecasts: employment, nominal earnings, and nominal consumption.

Summary of forecast error

2.17   Table 2.1 below shows in-year forecast accuracy measures for GDP, employment, nominal compensation of employees (COE) and nominal consumption from our first forecasts. We compare this to our estimates of the OBR's in-year forecast error for these variables based on their official forecasts database.

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[15] OBR (2018) Historical official forecasts database ([link](#))

Table 2.1: 2017-18 in-year forecast error, selected economy variables and OBR comparison (percentage point difference)

|		GDP (constant prices)	Employment level	COE (current prices)	Consumption (current prices)
Historic (OBR)	Average error	-0.29	-0.30	0.06	0.50
	Average absolute error	0.42	0.36	0.53	0.73
December 2017 forecast of 2017-18		-0.56	0.32	0.50	-0.88
May 2018 forecast of 2017-18		-0.55	0.10	-0.64	-0.52

Source: Scottish Fiscal Commission (2017) Scotland's Economic and Fiscal Forecasts – December 2017 (link), Scottish Fiscal Commission (2018) Scotland's Economic and Fiscal Forecasts May 2018 (link), OBR (2018) Historical official forecasts database (link)

Notes: COE is Compensation of Employees. OBR figures are for growth in nominal wages and salaries, the largest component of Compensation of Employees

2.18 In May 2018 we forecast GDP growth in 2017-18 of 0.7 per cent, and the outturn was 1.3 per cent. Our forecast error, the difference between these values, is 0.55 percentage points.

2.19 In Figure 2.1, the darker blue bars show the OBR's average forecast error, while the lighter stacked shaded area shows the OBR's average forecast error plus one standard deviation. The standard deviation is the average difference between the OBR's individual forecast error and their average forecast error. This illustrates the typical variation of the OBR's forecast error.

Figure 2.1: 2017-18 in-year absolute forecast error, selected economy variables and OBR average historic absolute error comparison (percentage point difference)
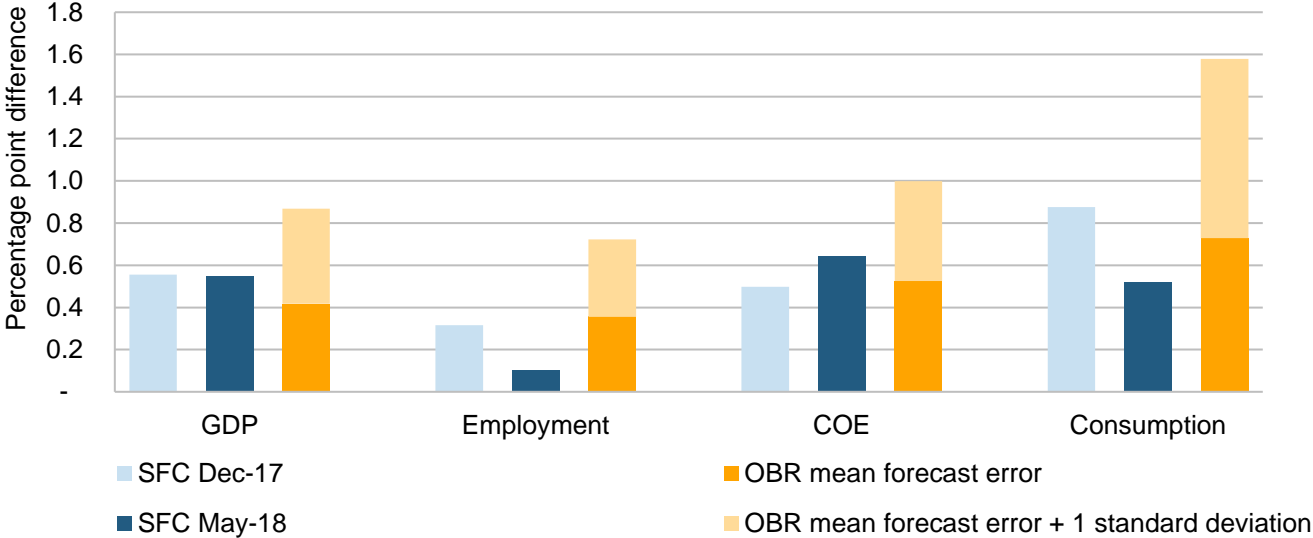
Source: Scottish Fiscal Commission, Scottish Fiscal Commission (2017) Scotland's Economic and Fiscal Forecasts – December 2017 (link), Scottish Fiscal Commission (2018) Scotland's Economic and Fiscal Forecasts May 2018 (link), OBR (2018) Historical official forecasts database (link)

2.20   Overall, we think our forecast errors sit within a range of what may be considered typical against the OBR benchmark. Our 2017-18 GDP forecast error was slightly greater than the OBR's average GDP forecast error, but was close to the OBR average relative to the variation within the OBR's own forecasting history.

2.21   Our forecasts of employment and consumption from May 2018 of 2017-18 compare favourably with the OBR's average forecast error. Our May 2018 forecasts also improved on our December 2017 forecast. This is to be expected given the additional, though still incomplete, in-year data on 2017-18 available in May 2018.

2.22   Compensation of employees (COE) is our measure of household income. Similar to GDP, growth in COE was revised up significantly in the latest economic data. COE is a major determinant in our income tax forecasts, and the impact of this forecast error on our income tax forecasts is discussed in the next chapter. We revised down our outlook for income and wages in our May 2018 forecast. As Table 2.1 shows, this led to a positive forecast error in December 2018 becoming a larger negative forecast error in May 2018. We will update our outlook for wages and incomes in our next forecast report.

Impact of data revisions

2.23 On 15 August 2018, Quarterly National Accounts Scotland (QNAS) was published with data up to 2018 Quarter 1.[16] This included significant revisions to a number of series, and revised the earlier estimates of GDP on which the Commission based its forecasts. Box 2.1 provides a summary of the QNAS data revisions.

Box 2.1: Summary of QNAS data revisions

Figure 2.2 shows estimates of Scottish GDP growth as published by the Scottish Government in June 2018 and in August 2018. In the August 2018 publication, the profile of GDP growth was revised significantly. Growth in the latest year, 2017-18, was revised up from 0.8 per cent to 1.3 per cent, a revision of 0.5 percentage points. Other years, notably 2014-15 and 2015-16, were revised down.

This was primarily because of revisions to construction industry activity. Growth in construction industry activity was revised down in 2015 from 18.3 per cent to 6.2 per cent, and revised up in 2017 from -3.8 per cent to 4.3 per cent. While the construction industry only accounts for around 6 per cent of GDP, these large revisions had a significant impact on total GDP.

Typically, revisions to annual GDP growth between publications tend to be around 0.1 percentage points. The scale of the revisions published in August is exceptional. The revision to annual GDP growth in 2017-18 of 0.5 percentage points is larger than any other recent revision.

Despite the significant revisions to year-on-year growth, the longer-term picture for the Scottish economy is largely unchanged. As Figure 2.2 shows, while GDP growth has been revised up in some years and down in others, average growth in Scotland since 2010-11 remained at around 1.1 per cent between the June and August publications.

Economic data will always be subject to revision. Measures of construction industry activity and its impact on economic growth over the last few years are by no means settled. While we are likely to continue to see revisions to recent data, we do not expect these revisions to be of a similar magnitude to those in August 2018.

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[16] Scottish Government (2018) Quarterly National Accounts Scotland, 2018 Quarter 1 (link)
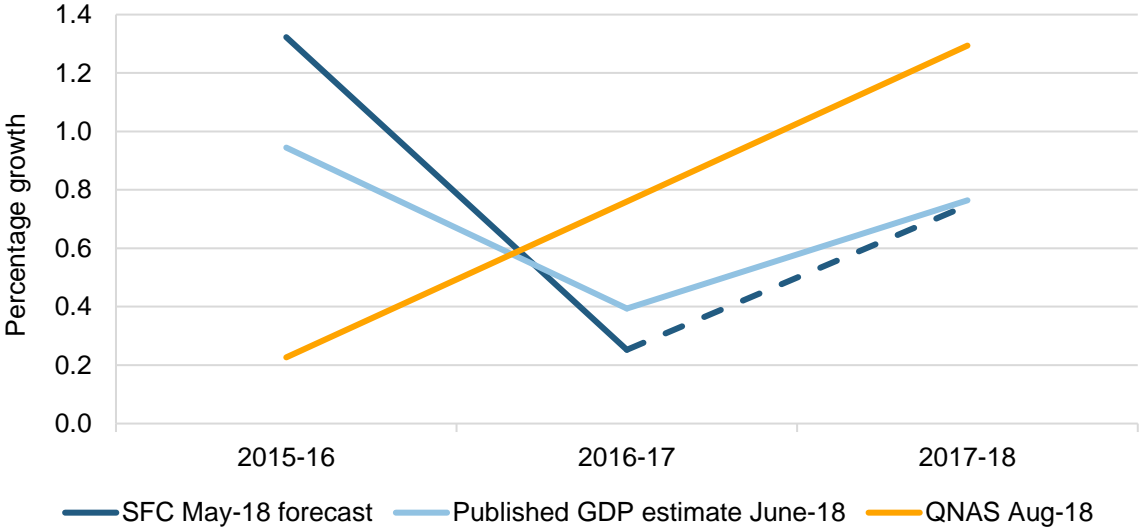
Figure 2.2: Revisions to Scottish GDP
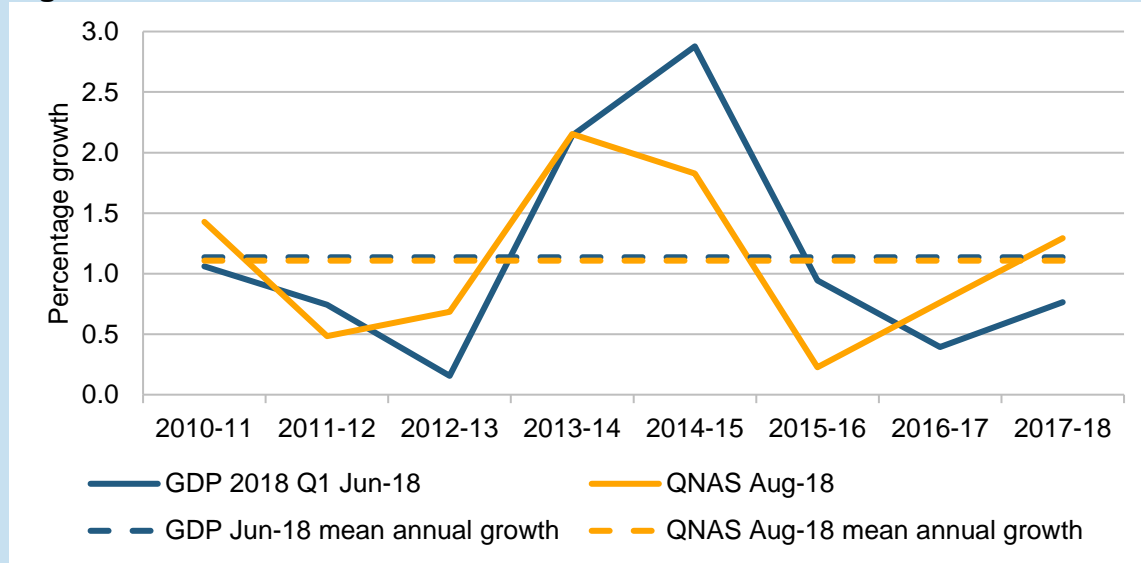
Source: Scottish Fiscal Commission, Scottish Government (2018) Quarterly National Accounts Scotland, 2018 Quarter 1 (link)

2.24 Figure 2.2 shows the SFC May 2018 forecast compared to the GDP data available at the time of the forecast and subsequent revisions. The solid orange line shows the GDP data on which the Commission based its May forecast. This included data published in April 2018 with estimates of GDP up to 2017 Q4.

2.25 GDP data up to 2018 Q1 was published in June 2018, providing the first estimate of GDP growth in financial year 2017-18. Figure 2.3 shows that, against this first publication following our forecast, the Commission's forecast was quite accurate.

2.26 However, QNAS data published on 15 August considerably revised the profile of GDP growth in Scotland. Estimated growth in 2017-18 was revised up from 0.8 per cent as published in June 2018 to 1.3 per cent as published in August 2018.

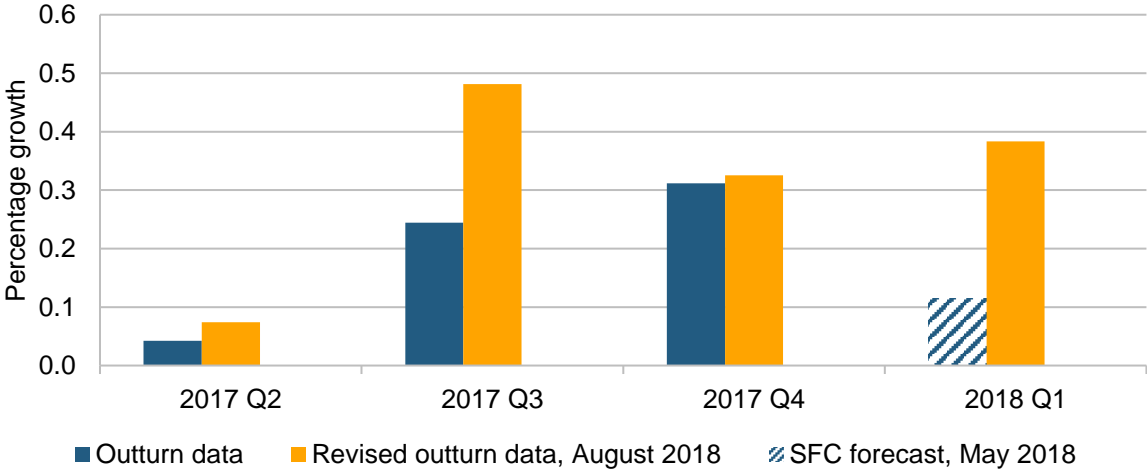**Figure 2.3: Revisions to Scottish GDP growth and SFC forecast**

Source: Scottish Fiscal Commission (2018) Scotland's Economic and Fiscal Forecasts May 2018 (link), Scottish Government (2018) Quarterly National Accounts Scotland, 2018 Quarter 1 (link)

Short-run 2017-18

2.27 When we created our May 2018 forecast of 2017-18, we already had three quarters of outturn data. This is shown in Figure 2.4.

Figure 2.4: Quarterly GDP growth rates, 2017-18, outturn (solid) and forecast (dashed), per cent growth

Source: Scottish Fiscal Commission (2018) Scotland's Economic and Fiscal Forecasts May 2018 (link), Scottish Government (2018) Quarterly National Accounts Scotland, 2018 Quarter 1 (link)

2.28 The solid blue bars show the available outturn data when we made our forecast, and the dashed blue area shows the forecast we made of 2017-18 quarter four.

2.29   Our total forecast error is made up of error in our forecast of the fourth quarter of 2017-18, but also by the revisions to earlier quarters of data. In order to have correctly forecast growth in 2017-18, we would have to have created our own estimates of GDP growth in 2017-18 for which there were already official estimates. In doing so, we would be attempting to predict revisions to the outturn data.

2.30   Despite us having an awareness that revisions to construction industry data were likely and could lead to significant revisions to outturn GDP data in 2017-18, we took a conscious decision not to attempt to predict revisions to outturn data. This decision sits at the centre of whether or not we could have had a lower forecast error for 2017-18.

2.31   The role of the Commission and the way our forecasts are used affects the way we create our forecasts. We have to produce detailed, disaggregated and internally consistent forecasts of the economy, at a quarterly frequency. This is different to other forecasters of Scotland, who tend to produce more aggregated forecasts at an annual frequency.

2.32   In May, we could have attempted to predict the precise revisions to GDP data. Producing GDP statistics requires complicated processes and models using a large set of input data. While we looked at some of the available input data, we cannot replicate the modelling approaches in house to accurately predict the impact of changes in the input data on GDP.

2.33   While we knew a significant revision was likely, we did not have sufficient information at the time to know the magnitude of the revision, nor how this would be spread across different years. We also could not have predicted how the revisions would affect the components of GDP, which we forecast on a consistent basis with our headline GDP forecast to feed in to our fiscal forecasts.

2.34   For the Commission to have publicly and explicitly created its own estimates of outturn GDP would have been a large judgement call. We did not believe it was practical for us to create our own estimates of outturn GDP in a thorough, systematic and robust way.

2.35   Our GDP forecasts affect whether or not the Scottish Government can access additional borrowing powers in the event of an economic shock. This can be triggered by either outturn data or our forecasts, or a combination of the two. For us to have based our forecasts on our own estimates of GDP would have made our GDP forecasts inconsistent with the outturn data on which a Scotland-specific economic shock can be judged to have occurred.

2.36   For our short-run forecasts, we took the decision to treat the official headline data as the best possible estimate of the economy at the time. Accepting that revisions are an inevitable part of economic forecasting, we believe that the

team of statisticians in the Scottish Government are best placed to do the work of measuring the economy.

2.37 We believe we made the right decision in not trying to anticipate the short-run impact of construction revisions on GDP data in 2017-18. However, the Commission has learned from this exercise, and in future we will continue to work closely with all producers of economic data to ensure we understand and can communicate the impacts of potential revisions on our forecasts.

Impact on post 2017-18 outlook

2.38 Looking beyond our short-run forecasts of 2017-18, one of the key judgements of the Commission was subdued growth in the Scottish economy over the next five years. A fundamental part of our forecasts was the insight that GDP growth had been slower in Scotland since 2010-11 than in earlier decades, and that we expected this period of slower growth to continue in the near term. Initial analysis of the revised QNAS data suggests that this remains broadly the case. This is shown in Figure 2.5, which compares our May 2018 forecast, and the data we had available at the time to the latest outturn data.

Figure 2.5: changes to GDP growth, 2010-11 to 2017-18, and averages, per cent growth
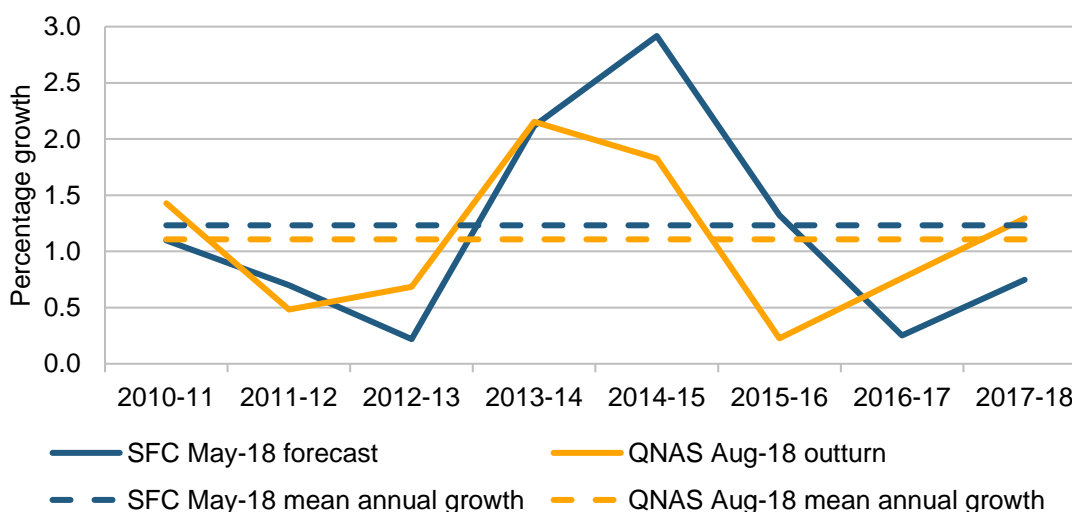
Source: Scottish Fiscal Commission (2018) Scotland's Economic and Fiscal Forecasts May 2018 (link), Scottish Government (2018) Quarterly National Accounts Scotland, 2018 Quarter 1 (link)

2.39 Despite now higher estimated growth in 2017-18, average growth since 2010-11 has actually been revised down. At the time of our May 2018 forecast, average growth since 2010-11 was 1.2 per cent. Revisions in the latest QNAS data means that average growth in GDP since 2010-11 is now 1.1 per cent.

2.40 For our longer-term forecasts, we focus on forecasting potential output. This is our estimate of the underlying trend of GDP. In estimating potential output, we attempt to control for and strip out the impact of the economic cycle and any short-term volatility. This is in contrast to the approach we take in the shorter-term, where we use headline GDP directly.

2.41 In our previous publications, we discussed our views on the volatility of construction industry data and how this affects the outlook for the Scottish economy. In our modelling of potential output and productivity, we explicitly strip out and control for the construction industry.

2.42 We will publish our next forecasts in the winter. At this point, we don't want to start to anticipate how those forecasts might change. However, we do not believe that the August 2018 QNAS revisions will have a significant impact on our outlook for the economy beyond 2017-18 for two reasons:

- Taking a longer-term view, growth in the Scottish economy is largely unchanged and, if anything, is now slower than before.

- We already controlled for the volatility in the construction industry in our potential output and productivity modelling and the revisions thus far support the way we did this.

2.43 The Commission's overall assessment of slower economic growth in Scotland remains the case, and if anything is reinforced by these latest estimates.

Conclusion on data revisions

2.44 The Commission has always been clear that forecasting is a significant challenge, and that forecasts will always contain a degree of forecast error. We have highlighted in the past the particular difficulties in the economy forecast of data revisions.

2.45 In our previous reports we discussed the impact on the economy of volatility in the construction industry. We identified that the measurement of the construction industry was a potential source of this volatility, and that we would have to continue to closely monitor the evidence in this area.

2.46 While we anticipated that revisions were likely, predicting the exact timing and impact of revisions is challenging, and to an extent incompatible with the way the Commission produces its forecasts.

2.47 Revisions to economic data have had a significant impact on the accuracy of the Commission's economy forecasts for 2017-18. We accept minor revisions to economic data as part of the nature of forecasting and do not generally attempt to explicitly predict or model the impact of this on our forecasts.

2.48 The construction industry was known to be an issue in the economic data for Scotland, and the resultant revisions to GDP exceptionally large. We do not expect such revisions to be commonplace.

2.49 Even with the exceptionally large revision to 2017-18 GDP, Figure 2.1 shows that our May 2018 in-year forecast of 2017-18 of 0.55 percentage points compares reasonably well to the OBR's average in-year GDP forecast error of 0.42 percentage points. Our forecast error is well within a range that may be considered typical.

2.50 In our GDP forecast and the components we have looked at in this report – COE and consumption - our forecast errors are broadly similar to the OBR. We discuss the impact of the error in our economy forecasts on our income tax forecasts in the next Chapter.

2.51 We were aware that revisions to the construction industry could have a potentially significant impact on GDP. Learning from this experience, if in the future we find ourselves in a similar position, we believe we could more clearly communicate the potential risks to the forecast as a result of the revision. We will continue to work closely with the Scottish Government to understand and communicate likely revisions.

Understanding our forecast error

GDP

2.52 Figure 2.6 shows a decomposition of our GDP forecast error by component of expenditure. Positive values indicate an overestimate. The black diamonds show how accurate we were at predicting growth in GDP. The coloured bars then show how much of the error in forecasting GDP was because of errors in our forecasts of the component of expenditure.

2.53 Our December 2017 and May 2018 forecasts for 2017-18, which are in constant prices, are compared to QNAS series deflated using the Scottish GDP deflator or implied deflators from the relevant UK series.

Figure 2.6: 2017-18 in-year GDP forecast error by component of expenditure, percentage points
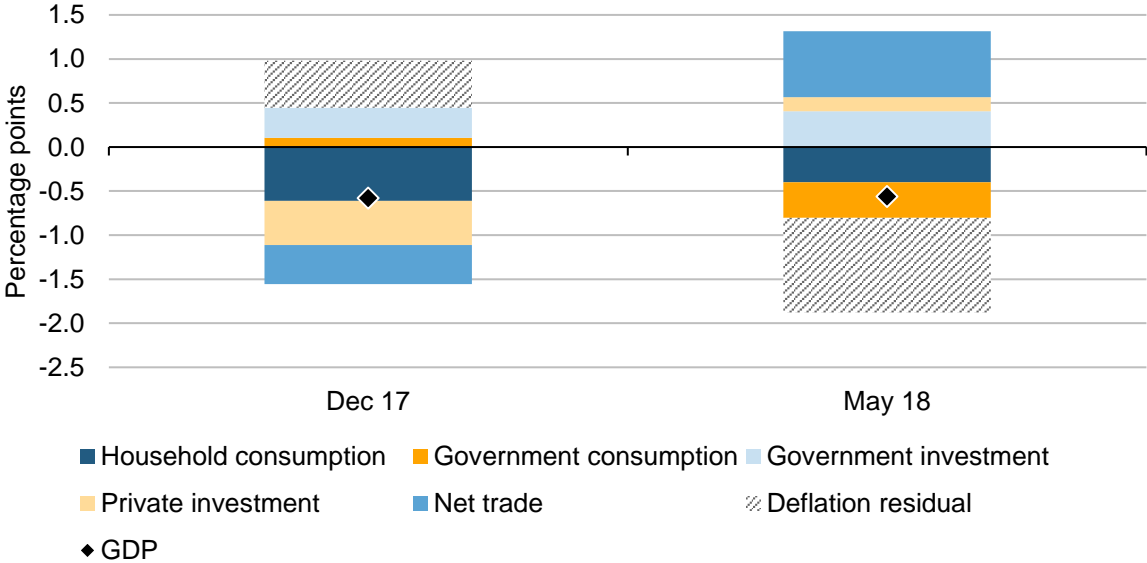
Source: Scottish Fiscal Commission, Scottish Fiscal Commission (2017) Scotland's Economic and Fiscal Forecasts – December 2017 (link), Scottish Fiscal Commission (2018) Scotland's Economic and Fiscal Forecasts – May 2018 (link), Scottish Government (2018) Quarterly National Accounts Scotland, 2018 Quarter 1 (link)

2.54   In Figure 2.6, negative values show where we under-forecast growth in GDP or one of its components, and similarly positive values show were we over-forecast growth.

2.55   In December 2017 we underestimated growth in household consumption. While we continue to underestimate growth in household consumption in our May 2018 forecast, it improved on our December forecast.

2.56   The largest source of GDP forecast error relates to the deflation residual. This highlights the importance of developing QNAS to include GDP by component of expenditure in constant prices, to ensure there is a published source from which to draw these data. We discuss this in our Statement of Data Needs published alongside this report.[17]

Employment

2.57   At the time of finalising our December 2017 forecast, we had labour market data covering the first quarter of 2017-18. By the time of our May 2018 forecast, we had labour market data covering the first three quarters of 2017-18. Figure 2.7 shows a decomposition of our employment forecast error, in a similar way as Figure 2.7.

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[17] Scottish Fiscal Commission (2018) Statement of Data Needs September 2018 (link)

Figure 2.7: 2017-18 in-year employment forecast error
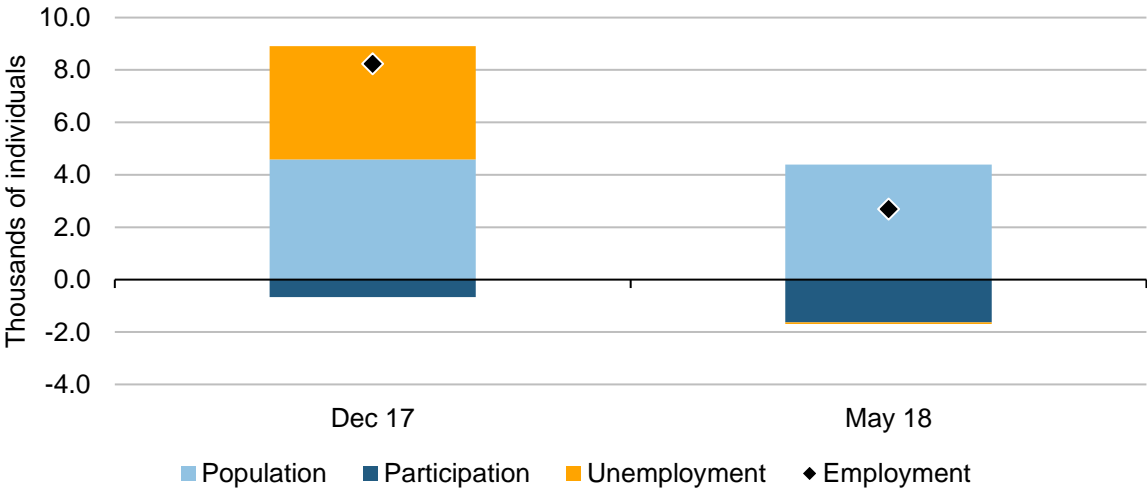
Source: Scottish Fiscal Commission (2017) Scotland's Economic and Fiscal Forecasts – December 2017 (link), Scottish Fiscal Commission (2018) Scotland's Economic and Fiscal Forecasts – May 2018 (link), ONS (2018) Regional labour market statistics in the UK: August 2018 (link), ONS (2018) Population estimates for the UK, England and Wales, Scotland and Northern Ireland: mid-2017 (link)

2.58   In December 2017, we overestimated how much unemployment would fall by in 2017-18, contributing around half of our overestimate of employment. We also overestimated population growth.

2.59   By May 2018, our forecast of changes in unemployment in 2017-18 had improved significantly. However, we continued to overestimate the impact of population growth on employment growth.

2.60   This suggests that in order to improve our employment forecasts we should look at our population forecasts. The data underpinning our population modelling comes from Mid-Year Population estimates and the ONS/NRS Population Projections, whereas our labour market data comes from the Labour Force Survey. These have slightly inconsistent estimates of the size of the population, and this may be part of the issue.

Conclusions

2.61   Despite exceptional revisions to the economy data, we are reassured that our longer-run modelling of the economy remains largely unchanged. This is partly because we had already captured the impact of construction industry volatility in our modelling, and partly because the significant revisions to the profile of GDP did not fundamentally change Scottish growth over the last few years.

2.62   We spend a significant amount of time interpreting economic data and analysing the underlying trends in the economy. This helped us to understand the potential impact of the construction industry on the economy and it is essential that we continue to do this in our work.

2.63   While our forecast of GDP growth in 2017-18 was accurate compared to the first outturn estimate, subsequent revisions meant a forecast error of 0.55 percentage points. This suggests that while our overall approach was reasonable given the data we had, it did not anticipate the exceptional data revisions. As discussed above, there are a number of reasons why it is not practical for the Commission to attempt to predict revisions to GDP data in its short-run forecasts. However, we believe there is scope to better anticipate and communicate with our users when data revisions may have a significant impact on our forecast.

2.64   This is our first evaluation of our first two economy forecasts. At this stage, it is hard to know whether any forecast error is because of one-off issues or simply volatility in the data on the one hand, or more systematic issues with the way we make our forecasts on the other. Over time, as we publish more forecasts and perform more evaluations, we'll be able to take a more systematic look at our forecasting performance. This does mean conclusions on areas for development at this stage are somewhat limited. Even still, one particular issue this evaluation has flagged is the way we model and forecast population growth and particularly the way this relates to our employment forecast. We'll review this aspect of our modelling before our next forecasts.

Chapter 3
Tax

3.1   This chapter provides an evaluation of our non-savings non-dividend income tax, NDR, LBTT and SLfT forecasts.[18] Each of the Commission's tax forecasting responsibilities have developed in different ways over time. This means that the scope and depth of evaluation differs between each area. The evaluation depends on the length of time for which a tax has been forecast, and also the availability of outturn data.

Income Tax

3.2   The Commission bases its forecasts on the best information available at the time of publication. Over time, new and sometimes better data sources can become available.

3.3   In our May 2018 forecasts, we forecast Scottish income tax liabilities using the Survey of Personal Incomes (SPI) Public Use Tape (PUT).[19] The SPI is a sample of HMRC taxpayer records, and the PUT is a publically available anonymised version of the SPI. At the time, this was the best available source of information on income tax liabilities for Scotland. The most recent PUT is for 2015-16. In effect we were forecasting income tax liabilities from 2016-17 onwards.

3.4   On 12 July 2018 HMRC published its first full outturn data for non-savings non-dividend (NSND) income tax liabilities in Scotland, covering the year 2016-17.[20] For the first time, this was based on full administrative data using

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[18] We have not evaluated our forecasts of the Scottish share of APD – outturn data is not available as the tax is collected on a UK-wide basis.
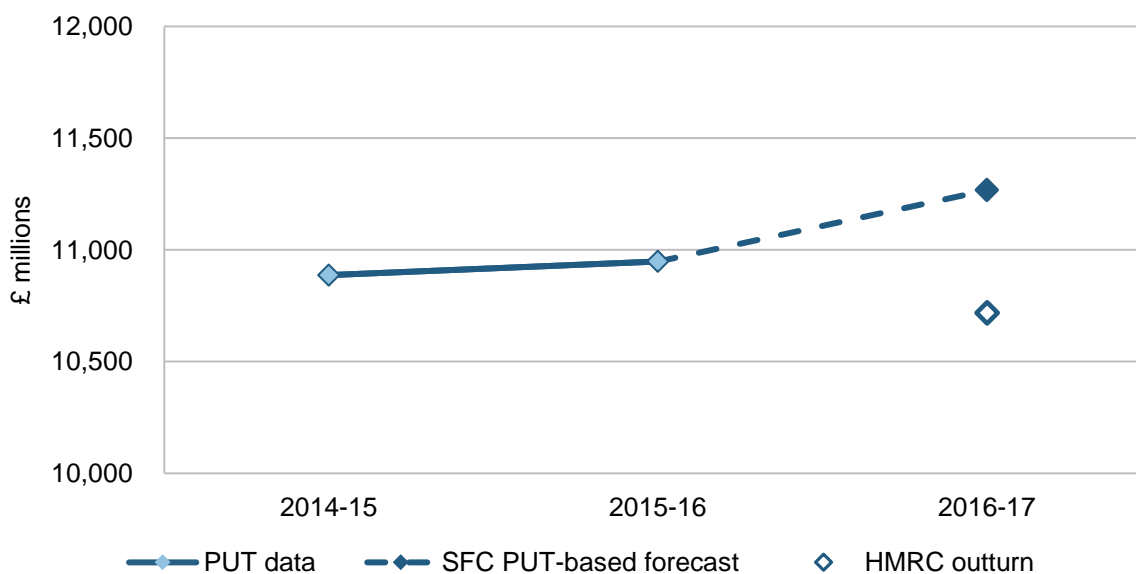
[19] Scottish Fiscal Commission (2018) Scotland's Economic and Fiscal Forecasts May 2018 (link)

[20] HMRC (2018) Scottish income tax: figures in 2017-18 HMRC Accounts (link)

Scottish taxpayer codes. Now that these data are available, they are the primary measure of total income tax liabilities in Scotland.

3.5 At the time of our May 2018 forecast, we had access to the 2015-16 PUT, but did not yet have access to 2016-17 outturn. There will never be outturn data for 2015-16 as this was prior to the introduction of the Scottish Rate of Income Tax (SRIT), and the PUT for 2016-17 will not be published until early 2019.

3.6 In our May report, we highlighted that we anticipated a number of underlying differences between our 2015-16 PUT-based estimate of income tax liabilities in 2016-17 and those that would be published by HMRC using outturn data. At the time, there was insufficient information to know the likely magnitude or direction of this difference.

3.7 HMRC reported Scottish NSND income tax liabilities for 2016-17 of £10,719 million. Figure 3.1 shows how this compares to PUT-based estimates of income tax liabilities and our estimate of 2016-17 income tax liabilities based on the 2015-16 PUT.

Figure 3.1: Scottish non-savings non-dividend income tax liabilities, estimates and outturn data

Source: Scottish Fiscal Commission (2018) Scotland's Economic and Fiscal Forecasts May 2018 (link), HMRC (2018) Scottish income tax: figures in 2017-18 HMRC Accounts (link)

3.8 Our PUT-based estimate of income tax liabilities in 2016-17 was around £550 million greater than the outturn data. However, the outturn data are also below PUT estimates of income tax liabilities in earlier years.

3.9 Some of the £550 million difference will be due to our forecast of how income tax liabilities would change between 2015-16 and 2016-17. However, we believe that more fundamental differences between the PUT and outturn data

account for a significant part of the £550 million difference. Over time, as we start to get PUT and outturn data covering the same years, we can explore this issue in greater depth.

3.10 Over the last two years, the OBR, the Scottish Government and the Scottish Fiscal Commission have all published estimates of 2016-17 income tax liabilities. These estimates were all based on SPI and PUT information for earlier years. Figure 3.2 shows similar and consistent overestimation of income tax liabilities in 2016-17 across these forecasts. We believe this consistent overestimation is because of underlying differences between the PUT and outturn data.

Figure 3.2: Scottish income tax forecasts and outturn data for 2016-17

Source: OBR (2016) Devolved taxes forecast - November 2016 (link), OBR (2017) Devolved taxes forecast – March 2017 (link), OBR (2017) Devolved taxes forecast – November 2017 (link), Scottish Government (February 2017) forecast (link), Scottish Fiscal Commission (2017) Scotland's Economic and Fiscal Forecasts – December 2017 (link)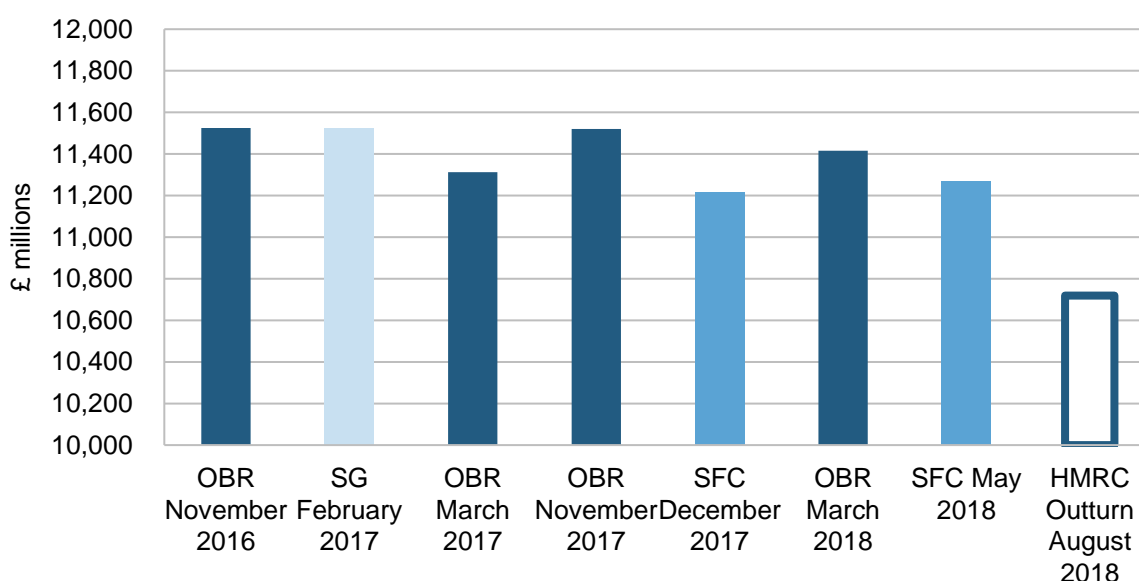, Scottish Fiscal Commission (2018) Scotland's Economic and Fiscal Forecasts – May 2018 (link), HMRC (2018) Scottish income tax: figures in 2017-18 HMRC Accounts (link)

3.11 As we highlighted in our May forecast, the differences between the PUT and outturn data come from a number of sources:

- The SPI and PUT are only a one to two per cent sample of all income tax records; the outturn data is based on full administrative data.

- In anonymising the SPI, the PUT aggregates some high value records, potentially losing some accuracy.

- There may be differences in the way Scottish taxpayers are identified between the SPI and the PUT, and the outturn data.

3.12 HMRC have published and shared with the Commission some high level aggregate figures from the outturn data that are helpful in giving us a

preliminary understanding of the drivers behind the difference between the two sources. However, over the longer-term, to fully understand the new outturn data, additional information will be needed, such as a breakdown of tax liabilities by marginal band. Alongside this report, we have published our annual Statement of Data Needs, in which we have discussed our engagement with HMRC on income tax data in further detail.[21] We should gain a better understanding of the relationship between the SPI/PUT and outturn data once the SPI/PUT 2016-17 is available in spring 2019.

3.13 Similar to the economy section, the analysis in the income tax section is dominated by the impact of new data. Given the significant changes in outturn data since our forecast, it is challenging to evaluate the underlying performance of our forecasts at this stage, as a large but unknown amount of our forecast error results from the apparent discrepancies between the SPI/PUT and outturn data.

Summary of forecast error

3.14 Table 3.1 shows the error in the latest Commission income tax forecast of £548 million. To provide context for the scale of this error, we include the OBR's average forecast error for UK income tax forecasts produced one-year ahead.[22]

Table 3.1: Headline forecast error and OBR benchmark

		£ million (scaled for OBR)*	Relative (%)
Historic error one - year ahead (OBR)	Average error	218	2.1
	Average absolute error	274	2.6
SFC May 2018 forecast		548	5.1

Source: Scottish Fiscal Commission (2018) Scotland's Economic and Fiscal Forecasts May 2018 (link), OBR (2018) Historical official forecasts database (link) Figures may not sum because of rounding.

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[21] Scottish Fiscal Commission (2018) Statement of Data Needs September 2018 (link)

[22] The OBR's UK income tax forecasting performance is not a perfect proxy for income tax forecasting in Scotland as the availability and timing of information is quite different. For example, historically, there has been better in-year data on UK income tax receipts than for Scotland. Here, we are comparing our forecast from May 2018 of income tax receipts in 2016-17 using 2015-16 PUT data to the OBR's forecasts made one year ahead of outturn, for example the March 2016 forecast of 2016-17 receipts. While we had more information on the economic environment for our one-year ahead estimate, the OBR would have had more information on recent outturn receipts. Access to UK income tax real time information on income tax means that in-year UK income tax forecasting will tend to be quite accurate. The UK income tax forecast also includes liabilities on savings and dividends. The average OBR forecast errors provided in Table 3.1 are not a perfect comparator for our forecast error, but they do provide useful context on the general scale of income tax forecast errors in the absence of outturn receipts data.

3.15 While the OBR's average one-year ahead income tax forecasting error is lower than the error in our latest forecast, errors of around five per cent in the OBR's income tax forecast are not uncommon.

3.16 The release for the first time of outturn data is an exceptional event and will have contributed a significant amount to our forecast error. As outturn data will now be published on a regular basis and we can calibrate our forecasts to this, we do not expect errors of this scale to be commonplace in our future forecasts of income tax.

3.17 In this section, we focus primarily on comparing our latest May 2018 estimate of income tax liabilities in 2016-17 to the new 2016-17 outturn data. Our modelling of 2016-17 income tax liabilities at the time of our December 2017 forecast was very similar to May 2018, with only a £50 million difference. The impact of new income tax outturn data applies equally to our December 2017 and May 2018 forecasts, with the same lessons learned and analysis.

Understanding our forecast error

3.18 Table 3.2 presents the estimated number of taxpayers in 2016-17 by marginal tax band. This compares our May 2018 forecast based on 2015-16 SPI data to the now available outturn data.[23]

Table 3.2: Comparison of number of taxpayers in 2016-17 by marginal tax band

	Band	SFC May 2018 forecast	HMRC outturn	Error	Relative error (%)
Number of Taxpayers	Basic rate	2,233,800	2,221,100	12,700	0.6
	Higher rate	308,500	294,000	14,500	4.7
	Additional rate	15,500	13,300	2,200	14.4
	All	2,557,800	2,528,400	29,400	1.1

Source: Scottish Fiscal Commission, Scottish Fiscal Commission (2018) Scotland's Economic and Fiscal Forecasts May 2018 (link), Figures may not sum because of rounding.

3.19 In all cases, our modelling overestimated the number of taxpayers in 2016-17. The scale of this error becomes larger as you move up through the tax bands. While we had a reasonable estimate of the number of basic rate taxpayers, with an error of only 0.6 per cent, this grows to an error of 14.4 per cent for additional rate taxpayers.

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[23] Scotland now has a five band income tax system, introduced in tax year 2018-19. In 2016-17, income tax in Scotland still operated on a three band system, and we present our breakdown on this basis for this year.

3.20 HMRC provided us with outturn figures for the number of taxpayers by band. At this stage, we do not have estimates of outturn liabilities by band. It is informative to see how much of an impact our overestimate of the number of taxpayers might have had on our liabilities forecast. Table 3.3 shows our estimate of the average tax liability of taxpayers by band, based on the 2015-16 PUT and our latest forecast. The table then provides an illustrative calculation of what impact our number of taxpayers error would have had on the aggregate forecast error given these average liabilities estimates.

Table 3.3: Estimated impact on forecast error correcting for taxpayer population

Taxpayer band	Estimated average tax liability (£)	Number of taxpayers forecast error	Illustrative impact on total error (£ million)
Basic rate	2,266	12,700	29
Higher rate	14,556	14,500	211
Additional rate	117,591	2,200	263
All		29,400	502

Source: Scottish Fiscal Commission. Figures may not sum because of rounding.

3.21 Our error in forecasting the number of additional rate taxpayers was relatively low, with a difference of only 2,200 taxpayers. However, these taxpayers have very high tax liabilities. Table 3.3 shows that, for the average liability of an additional rate taxpayer of £117,600, our number of taxpayers forecast error would have affected our forecast of liabilities by around £260 million.

3.22 Performing this exercise across all taxpayer bands, our error in forecasting the number of taxpayers could have affected our forecast of liabilities by around £500 million holding all else constant, out of a total error of around £550 million.

3.23 This is an important insight. Our forecast error could come from either error in the number of taxpayers, or from error in our estimates of those taxpayers' incomes. This analysis strongly suggests that error in the number of taxpayers is a bigger factor than error in estimates of their incomes.

3.24 As we said above, we cannot know for certain at this stage the extent to which our overall error in 2016-17 is because of our forecast error, or because of data issues in comparing the Scottish estimates in the PUT to the new outturn data. At this stage, we strongly suspect that differences in estimates of taxpayers between the SPI and the PUT, and outturn data, is a major factor.

3.25 Considering all these factors suggests that, while the PUT may do a good job of estimating the overall shape of the income distribution in Scotland, it appears to be overestimating the number of taxpayers relative to outturn data. This is particularly the case at the top end of the distribution for the highest income taxpayers.

3.26 The PUT could be overestimating the number of taxpayers relative to outturn data for a number of reasons:

- The 2015-16 PUT was based on addresses held by HMRC. This would not have aligned perfectly with Scottish taxpayer status in all instances. For example, taxpayers whose primary residence was in Scotland, but they spent more time in England in that year.

- There could be some issues with correctly identifying all UK taxpayers as either Scottish or rUK in the outturn data.

- In the PUT, high value records are aggregated together to prevent disclosure of taxpayer information, creating what are called composite records. This is done at a UK level, with certain shares assigned to Scotland. Given there are relatively more additional rate taxpayers in the UK than in Scotland, this could introduce an upwards bias in the number of additional rate taxpayers in the PUT. In our statement of data needs, we have asked HMRC to explore the possibility of Scotland specific composite records.

- The PUT is based on the SPI which, as a sample, is subject to sampling errors

Aligning our forecast to outturn data

3.27 The PUT appears to provide a different estimate of the number of Scottish taxpayers and their liabilities compared with the outturn data. We cannot know for certain the exact number of people who should be identified as Scottish taxpayers, as both the PUT and outturn data may have some error. What is most important though is the number of taxpayers and their liabilities as estimated in HMRC's outturn data. This is the principal estimate of liabilities in Scotland, and will be used as the final figure to which the Block Grant Adjustment will be resolved. The HMRC outturn figure is the one that the Commission will be forecasting.

3.28 The outturn data are only available at a highly aggregated level. We create our income tax forecasts using detailed taxpayer data as provided by the PUT. This microsimulation approach is necessary to capture many of the mechanics of the income tax system. Now that we have the HMRC outturn

data, we will align our microsimulation PUT-based forecasts with the outturn data in the years for which these are available.

3.29   We are in the process of developing a methodology to align our forecasts with the outturn data. By calibrating our forecasts to this new information, our future forecasts are less likely to be subject to such errors caused by underlying data differences. We will discuss this approach in full in our next forecast report.

Impact of economy forecast

3.30   Our economy forecasts are a significant determinant of our income tax forecasts. Over the long run, we would like to understand how any errors in our economy forecast affect our income tax forecast.

3.31   Our economy forecast evaluation focusses on the year 2017-18, as this is the window of time for which we now have data that wasn't available when we created our latest economy forecasts. Our income tax evaluation is focussing on 2016-17, as similarly this is the year for which we now have outturn data.

3.32   While we do not yet know our income tax forecast error for 2017-18, as an illustrative exercise, we can say how much impact our economy forecast error has had on our income tax forecast.

3.33   As discussed in Chapter 2, the latest economy outturn data included significant revisions. GDP growth in 2017-18 is now estimated to be 1.3 per cent, above our May forecast of 0.7 per cent. This high growth feeds through to our modelling of incomes, with growth in compensation of employees also revised up in the latest economic data. In May 2018, we forecast growth in compensation of employees in 2017-18 of 2.1 per cent. The latest economy data shows growth in compensation of employees of 3.2 per cent.[24]

3.34   Table 3.4 illustrates the impact of this difference on our income tax forecast. This analysis does not take account of the lower than expected 2016-17 income tax outturn data discussed above. This is an illustrative exercise to show the impact of the economy forecast error on the income tax forecast in isolation. This shows that, in isolation, our under-estimate of economic growth in 2017-18 has taken around £188 million off our income tax forecast for that year.

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[24] Scottish Government (2018) Quarterly National Accounts Scotland, 2018 Quarter 1 (link)

Table 3.4: Illustrative impact on 2017-18 liabilities forecast of error in economy forecast

£ million	2017-18 NSND income tax liabilities
SFC May 2018 forecast	11,467
Illustrative 2017-18 outturn economy data	11,654
Difference	188

Source: Scottish Fiscal Commission, Scottish Fiscal Commission (2018) Scotland's Economic and Fiscal Forecasts May 2018 (link). Figures may not sum because of rounding.

Conclusions

3.35 We believe a significant proportion of the 2016-17 forecast error is because of the underlying data used in the forecast. Given the information available at this time, it is not possible to know to what extent our overall error is because of either data error or to other sources of forecast error and therefore to identify improvements required in our forecasting approach.

3.36 Our evaluation has suggested that our estimates of the number of taxpayers in 2016-17 was a greater source of error than our estimates of their individual incomes or liabilities, and we will reflect on this in our modelling.

3.37 At present, we only have PUT data for up to 2015-16, and outturn data for 2016-17. The apparent divergence between these two datasets makes it challenging to identify non-data sources of error. Once we have these datasets covering the same time period, and we have aligned our forecasts to outturn data, we should be able to start to understand better our own forecast error.

Non-Domestic Rates

3.38 Since 1 April 2017 the Commission is responsible for producing forecasts of the contributable amount of Non-Domestic Rates (NDR).[25] Compared to some other taxes, we would expect NDR income to be relatively stable. Our December 2017 forecast error of 1.8 per cent or £50 million for 2017-18 is in line with this expectation. Income is collected from a large tax base – all eligible non-domestic property across Scotland – which doesn't grow or decline with the same volatility as for other taxes, such as LBTT.

3.39 Despite this, individual components of our forecast may be subject to larger scale volatility and error. There are several factors that present challenges when forecasting the amount of revenue to be raised from NDR.

- **Uncertainty around the tax base because of revaluation.** Following a revaluation of the tax base, ratepayers have the right to appeal the valuation given to their property by independent Assessors. After the most recent revaluation took effect in April 2017, 73 per cent of rateable value had an appeal against it at the end of 2017-18.[26] There is further uncertainty which stems from the resolution of appeals from revaluations that took place before 2017.

- **Policy changes relating to both the package of reliefs available and the administration of the tax.** In December 2015 the Scottish Government announced changes to Empty Property Relief, while in December 2017 six policy changes were announced affecting reliefs available to ratepayers. Significant changes like these increase uncertainty around revenue forecasts, given the challenges associated with estimating the impact of any changes in advance of their implementation.

- **Test cases heard in court can impact large sections of the tax base.** A recent case was heard in the Court of Sessions regarding valuation of properties in the North East. If the decision had gone in favour of the appellant it would have significantly lowered valuations for certain properties in the Grampian area, and consequently lowered NDR income.[27]

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[25] This report is our first full evaluation of forecasts of NDR income. Our September 2017 evaluation report considered only individual elements of the Scottish Government's December 2016 forecasts that were under our previous non-statutory remit.

[26] Scottish Government (2018) Non-Domestic Rates Revaluation Appeals 2017-18 Q4 (link)

[27] Lands Valuation Appeals Court (2018) The Assessor for Grampian against Anderson, Anderson and Brown LLP and others (link)

- **Behavioural changes with respect to factors such as take-up for relief schemes.** Expenditure on certain reliefs has historically grown faster than the tax base. An example of this is charitable relief, which has consistently grown faster than Gross NDR Income, as shown in Figure 3.3. One possible explanation is the increasing use of Arm's-Length External Organisations (ALEOs) among local authorities, which are eligible to claim charitable relief.[28] The Scottish Government has announced its intention to offset reliefs granted to councils for newly created ALEOs, which may in turn reduce the future growth in expenditure on charitable relief.[29] Judging the impact of this, given the limitations of the data, will present another source of uncertainty in future forecasts.

Figure 3.3: Growth in Charitable Relief versus growth in Gross Income
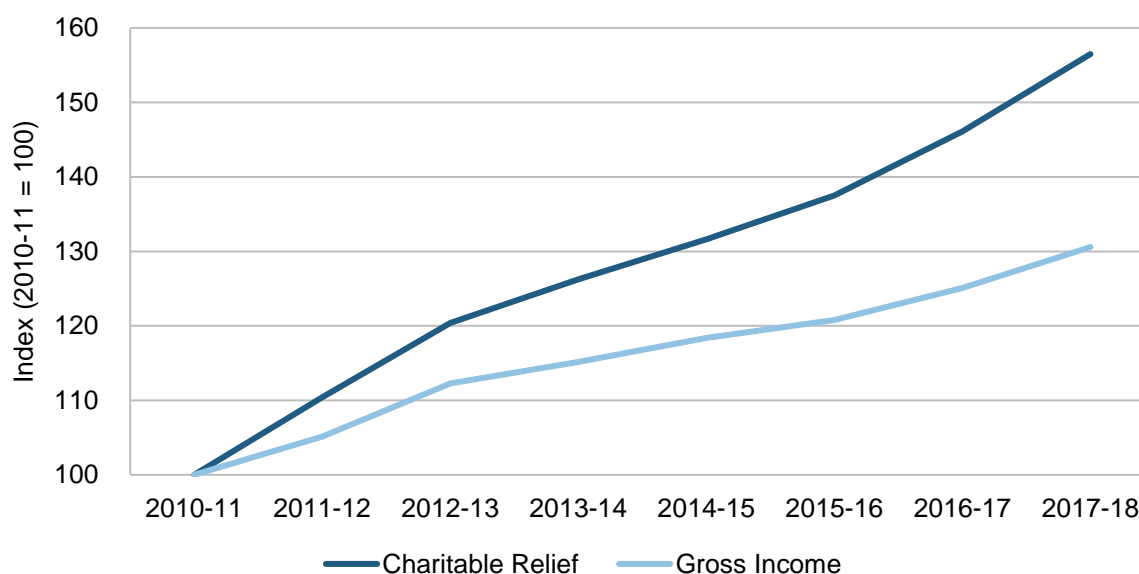
Source: 2010-11 to 2016-17 final audited NDRi returns, 2017-18 Notified NDRi returns ([link])

3.40 The Scottish Government uses our NDR forecast to help inform its decision before the start of the financial year regarding the size of the transfer made in each financial year to local authorities (the distributable amount). In our previous reports, we have described the 'NDR Rating Account' or 'White Paper Account', which shows the annual and cumulative balance of the distributable and contributable amounts.[30] Box 3.1 builds on this previous analysis by setting out how the balance is calculated from year to year and

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[28] A recent report from the Accounts Commission highlighted relief from Non-Domestic Rates as a key consideration for councils considering establishing ALEOS. Accounts Commission (2018) Councils' use of arm's-length organisations ([link])

[29] Scottish Government (2017) Non-domestic rates: Implementation plan in response to the Barclay review ([link])

[30] For further detail see Scottish Fiscal Commission (2018) Scotland's Economic and Fiscal Forecasts May 2018 ([link]) Box 3.2 pp 114-115

the link between the balance of the NDR Rating Account and our forecast error.

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Box 3.1: Non-Domestic Rating Account and our forecast error

NDR is subject to an arrangement that sees income collected by local authorities, pooled by the Scottish Government before being redistributed back as part of the local government finance settlement.[31] While in previous years the Government had distributed more NDR income to local authorities than was collected, in the last two years they have begun to address this by distributing an amount lower than forecast.[32]

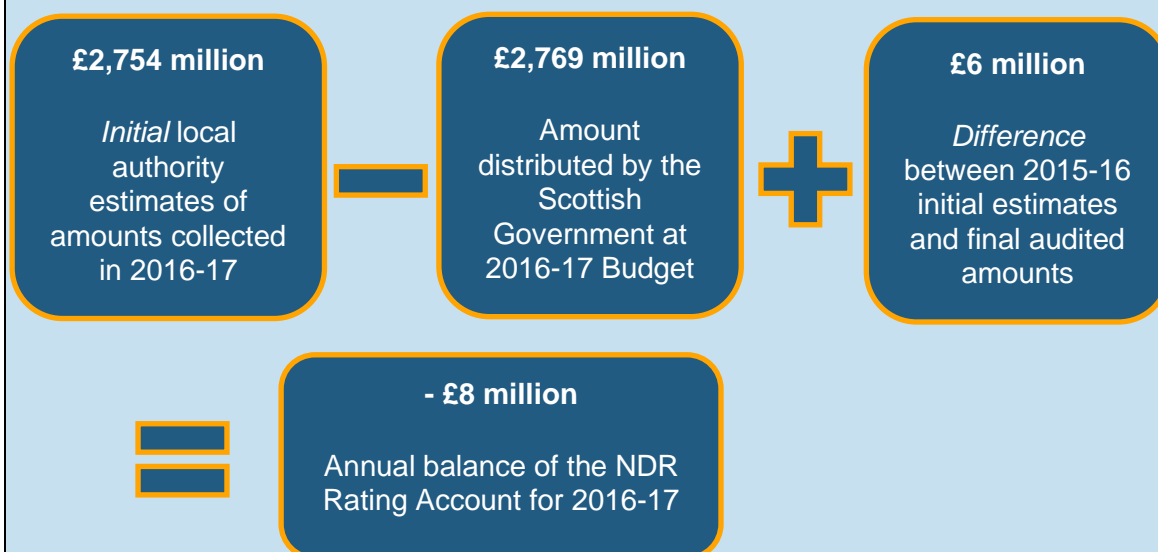**The calculation of the balance in the NDR Rating Account**

Our report in May described how the balance of this pooling and redistributing exercise is recorded in the NDR rating account. The timing regarding decisions around the amount to be distributed in any given year means the account shows either a surplus or deficit. For the published audit of the account, the final balance depends on an interaction between local authorities self-reported initial estimates of the amounts collected, amounts distributed by the Government, and differences between start of year estimates and actual collections from the year before.

A simplified example of the calculation of the 2016-17 account balance is shown below, with the key determining factors highlighted. When published, the 2016-17 account recorded an annual deficit of £8 million on the account at year-end. As can be seen from Figure 3.4, this balance depended on data returns submitted by local authorities to the Scottish Government at different points in time.

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[31] Details of the settlement for 2017-18 can be found here (link)

[32] For further detail see Scottish Fiscal Commission (2018), (link) Box 3.2 pp 114-115

£2,754 million

Initial local authority estimates of amounts collected in 2016-17

—

£2,769 million

Amount distributed by the Scottish Government at 2016-17 Budget

+

£6 million

Difference between 2015-16 initial estimates and final audited amounts

=

- £8 million

Annual balance of the NDR Rating Account for 2016-17

Source: Scottish Government (2017) Non Domestic Rating Account for year ended 31 March 2017 (link). Figures may not sum because of rounding.

How this links to our forecast error

As part of Budget 2018-19, the Government set the amount distributed to local authorities, with the aim of bringing the account into balance by the end of 2018-19. This decision was made using our forecast. Even if the Scottish Government sets the distributable amount equal to our forecast, the balance of the NDR rating account will not be determined solely by our forecast accuracy. In practice, even if our Budget forecast for 2018-19 turned out to be entirely accurate, the account could still show a surplus or deficit because of what local authorities had estimated they would collect at the start of the year. Because of this, any error in our Budget forecasts will not necessarily show in the balance of the Rating Account that same year. Instead, it may not be until the next year when reconciliation between estimates and audited figures are carried out that any impact is reflected in the account balance. Care should therefore be taken when interpreting our forecast error alongside the published balance of the NDR Rating Account in any one year.

Summary of forecast error

3.41 The summary of the in-year forecast error for our December 2017 forecast of 2017-18 NDR income is presented in the table below. Alongside this, historic in-year forecast error from the OBR's UK-wide NDR forecast is also presented. It should be noted that our forecast error for 2017-18 has been assessed against provisional outturn data on NDR collections by local

authorities. The scale of error may be subject to change once final audited figures are available.[33]

Table 3.5: Average absolute OBR and SFC in-year forecast error (%)

OBR average error (2010-11 – 2016-17)	SFC error Dec 2017 forecast
1.6	1.8

Source: OBR (2011-2017) November/December Economic and Fiscal Outlooks (link), Scottish Fiscal Commission (2017) Scotland's Economic and Fiscal Forecasts – December 2017 (link), 2017-18 Notified NDR returns (link)

3.42   Our in-year forecast error for 2017-18 was 1.8 per cent, which is comparable in scale to the OBR's historic average error. We would also note that the tax base for the UK as a whole is considerably larger than it is for Scotland, which lowers the impact of any single unanticipated loss due to appeal. As shown in Figure 3.5, the main reason for our error was that our forecast for gross income was £38 million higher than the observed figure for the financial year. We also under-forecast the amount of mandatory reliefs claimed, contributing another £12 million to our overall forecast error.

3.43   The Scottish Government have not published in-year forecasts.[34] Based on the figures that have been published the average absolute forecast error for the SG for one year ahead was 2.6 per cent over the last revaluation cycle.[35] We will be able to make a direct comparison with our forecasts as of next year's Forecast Evaluation Report.

3.44   We need to be cautious in comparing the figures for forecasting error, as we might expect the error at the start of a revaluation cycle to be lowered by relatively fewer appeals from the new cycle. April 2017 was the start of the new revaluation cycle. We note that the Scottish Government's average forecast error reflects a large contribution from an individual test case regarding a material change in circumstance case for a shopping centre.[36] To compensate for the risk of the court finding in favour of the appellant, the Government forecasts contained a large appeal loss assumption. As the

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[33] The average annual difference between provisional outturn and final audited figures between 2010-11 and 2016-17 was just over £1 million.

[34] For our December 2017 forecast, we were provided with the Scottish Government's December 2016 forecasts, which did contain an in-year estimate for 2016-17. We are thus able to make a comparison with the associated forecast error, which we do from paragraph 3.55 in this report.

[35] While the Scottish Government has previously not published its forecasts of NDR income in Budget documents, forecasts are available retrospectively in Annex F of Scottish Local Authority Finance Statistics and are used here for context. Scottish Government (2018) Scottish Local Government Financial Statistics 2016-17 (link)

[36] Argos Distributors Limited, C&J Clark International Limited and HMV UK Limited against Fife Council Assessor 10th December 2010 (link)

case subsequently found in favour of the Assessor, NDR income was higher than forecast.

Understanding our forecast error

Figure 3.5: 2017-18 in-year forecast error decomposition
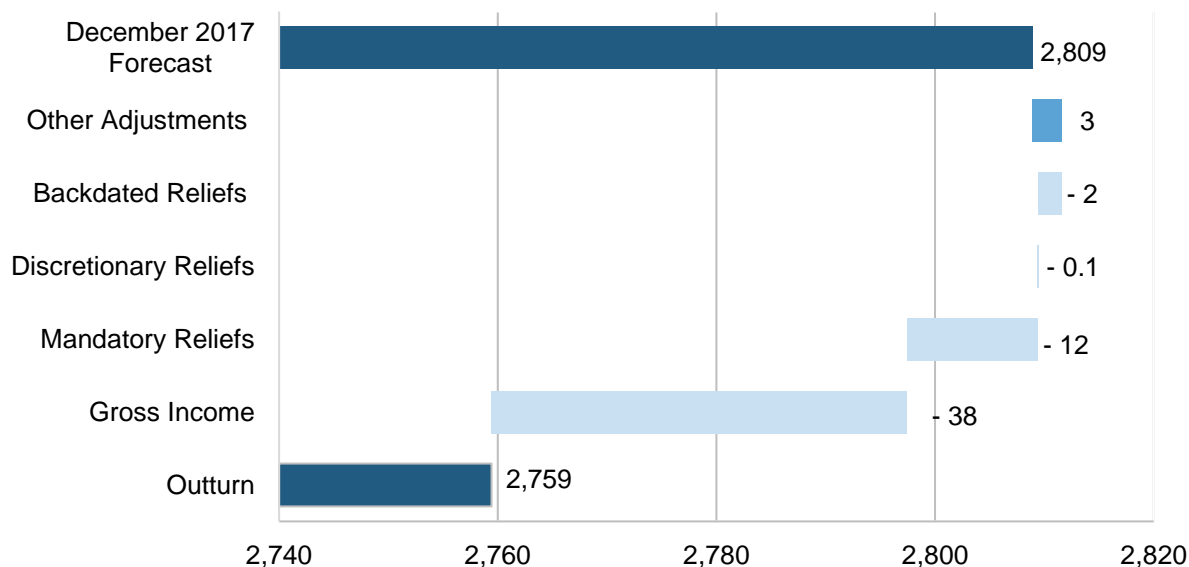
Source: Scottish Fiscal Commission (2017) Scotland's Economic and Fiscal Forecasts – December 2017 (link), Tax raised from 2017-18 Notified returns. Figures may not sum because of rounding.

Gross income

3.45 Gross income is the total estimated tax liable, before accounting for any reliefs, or other factors that reduce NDR income such as debt write-offs. Given the data that are available to us, we are only able to assess the contribution of growth in the tax base (also known as buoyancy) to the gross income forecast error.[37]

3.46 Buoyancy in 2017-18 was 1.4 per cent, compared to 1.7 per cent forecast in December 2017.[38] In terms of rateable value, this equates to a forecast error of £27 million, which in turn lowers NDR gross income by roughly £13 million in 2017-18, therefore accounting for 35 per cent of the overestimate of gross income in 2017-18.

3.47 The main reason for this overestimate was that our projections of growth in the tax base were raised through the use of the long-term average rate of buoyancy, which included pre-crisis data of lesser quality. For our May

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[37] We would note that NDR is paid on a pro-rata basis, which we abstract from in our modelling because of data availability. This will be only a very minor additional source of forecast error.

[38] Note that this analysis excludes the one-off addition of shootings to the valuation roll mid-2017. As of April 2018 this had added just over £18 million in rateable value to the valuation roll.

forecast we updated our approach, instead basing our projections on more recent and complete data. Our estimate of 2017-18 buoyancy in May was much closer to outturn, contributing just a £1 million error in forecast gross income. Had we taken this approach in December 2017, our forecast error for gross income would have been roughly £8 million lower.

3.48 Analysis of the valuation roll also suggests that a slightly lower number of large properties were added to the roll in 2017-18 compared to previous years. In addition to this, there have also been several administrative changes to the valuation roll through 2017-18 which have lowered rateable value. The largest of these is Fallago Rig wind farm which saw its rateable value fall by £3 million in 2017-18 as the result of an amended entry by the Assessor, which in turn lowered gross income by roughly £1.5 million.

3.49 The factors listed above can explain over 80 per cent of the lower than forecast buoyancy.

Mandatory reliefs

3.50 Mandatory reliefs accounted for £12 million of the forecast error. Table 3.6 shows our forecast errors for each mandatory relief. The major drivers were Empty Property Relief, Transitional Relief and Charitable Rate Relief.

Table 3.6: Forecast errors for mandatory reliefs

	Forecast Dec 17 (£ million)	Notified Return (£ million)	Difference (£ million)	Error (%)
Empty Property Relief	79	94	-15	-15.4
Transitional Relief – Hospitality	26	21	5	23.8
Charitable Relief	190	193	-4	-1.9
Transitional Relief – Offices (Aberdeen and Aberdeenshire)	4	3	2	53.3
Small Business Bonus Scheme	239	241	-1	-0.5
Transitional Relief – Hydro schemes	2	2	1	30.3
Disabled Rates Relief	62	62	1	0.8
Religious Relief	26	26	0	-0.7
Other	7	7	0	-1.9
Total	**637**	**649**	**-12**	**-1.8**

Source: Scottish Fiscal Commission (2017) Scotland's Economic and Fiscal Forecasts – December 2017 (link), 2017-18 Notified returns. Figures may not sum because of rounding.

Notes: Notified returns figures should be considered provisional. Final audited figures will be published as part of the Scottish Government's Local Government Finance Statistics. "Other" includes expenditure on the following reliefs: New Start, Fresh Start, Sports Clubs, Rural Rate Relief, Renewable Energy Scheme, District Heating, and Enterprise Areas.

3.51 The forecast error for Empty Property Relief highlights what is likely to be a persistent source of error in our forecast. At the time of our forecast mid-year

estimates of relief expenditure were available from local authorities. A key judgement was required as to whether the fall in relief expenditure observed in 2016-17 as a result of a policy change would continue. As Figure 3.6 shows, there is no easily predictable trend for the amount of relief claimed. This can in part be attributed to the frequency with which the criteria for and administration of the relief are changed.[39]

3.52   A further complication with interpreting the 2017-18 data was the impact of the 2017 revaluation. A fall in expenditure on this relief could have been caused by a combination of a reduction in the poundage and a fall, or even just lower than average growth, in the rateable values of properties likely to claim this relief.

Figure 3.6: Empty property relief difference between notified and mid-year estimates
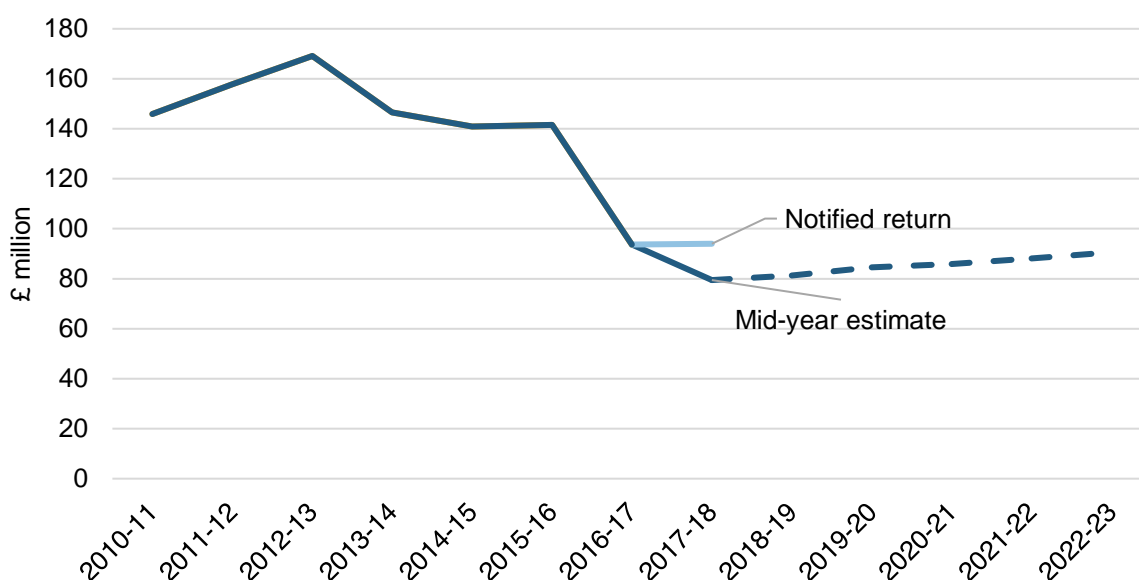
Source: Audited figures between 2010-11 and 2016-17, Notified and MYE for 2017-18 along with Dec 2017 forecast based on MYE (link)

3.53   Of the £7 million forecast error from Transitional Relief, £5 million was from the forecast for the hospitality-related portion, £1.6 million came from the relief specific to offices in Aberdeen and Aberdeenshire and the remaining £0.6 million was from Hydro Relief. The modelling choice made in December was to use an average of the 2017-18 Mid-Year-Estimate (MYE) data and our 2018-19 costings, rather than base our forecast on the Scottish

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[39] In 2013-14, policy was changed so that empty commercial property could claim 100 per cent for the first three months and 10 per cent relief thereafter rather than 100 per cent for the first three months and 50 per cent thereafter (link). As of 2016-17, empty commercial property can claim 50 per cent relief for the first three months, 10 per cent up to five years and then faces a 10 per cent surcharge thereafter. For empty industrial property, 100 per cent relief can be claimed for the first three months, with the relief schedule reverting to being the same as for commercial property thereafter (link).

Government's Draft Budget 2017-18 costing or the MYE data alone. Had we implemented the latter, our forecast error would have reduced to a £2 million underestimate. Our choice to use the averaging approach was based on the knowledge at the time that the MYE alone would produce an underestimate. Using the Scottish Government's 100 per cent take-up assumption would have increased our forecast error by £10 million.[40]

Other sources of forecast error

3.54   There was a small £2 million contribution to the overall forecast error from adjustments to NDR income stemming from other sources such as appeals losses and bad debts. Based on previous experience, appeals and bad debts figures can change significantly between the notified return and the final audited figures. We will revisit this issue as part of our upcoming forecasts once the final audited figures are available.

Comparison with SG forecasts

3.55   The Scottish Government produced the forecast of 2017-18 NDR income used in December 2016. Looking at the in-year forecast that was produced at that time for 2016-17 is helpful in understanding whether any source of error identified in our forecast appears to persist between years. Final audited figures for 2016-17 indicate outturn was £68 million lower than forecast in December 2016. This translates to an error of 2.5 per cent.

3.56   Similar to our own in-year forecast, gross income was lower than expected. This accounted for £21 million of the total error. As outlined in our previous Forecast Evaluation Report, one contributing factor to this was that growth in the tax base was significantly lower than expected.[41] This accounted for around half the total gross income error in 2016-17. At our May forecast we revised our approach to projecting buoyancy. We now focus on more recent experience of growth in the tax base to generate our projections. We will monitor whether this change lowers the average error in our future projections of gross income and return to this in future evaluations.

3.57   Mandatory reliefs were also a major source of error in the Government forecast, with expenditure £18 million higher than forecast. Empty property relief was again the largest contributor to this, and was responsible for roughly half the total error. Given 2016-17 was the year in which a major policy change was implemented it is perhaps not surprising that MYE data were not a true reflection of the final audited returns. As this was something

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[40] The Scottish Government's assumption and costing made in December 2016 are not official Government costings and were not published in the Draft Budget documents. However, these forecasts were produced at the time and provide useful information for this assessment.

[41] Scottish Fiscal Commission (2017) Forecast Evaluation Report September 2017 (link)

we also experienced in our own forecast, we will continue to investigate the reliability of MYE data for empty property relief.

Assessment of policy costings

3.58 Our December 2017 forecast contained seven costings for policy changes made as part of Draft Budget 2018-19. As these were scheduled to start from April 2018, the assessment of these costings will be included in our Forecast Evaluation Report in 2019. It is important to note that there will be some instances in which we will never be able to assess our costings, for example in cases in which we have had to cost a policy with reference to an unobserved counterfactual.

May 2018 forecasts

3.59 Our forecast for NDR made in May 2018 included an in-year forecast for 2017-18 of £2,774 million, which was £15 million over the provisional outturn of £2,759 million. The £35 million reduction in our forecast error can be attributed to updated Valuation Roll data and data on appeals losses from the 2010 revaluation cycle. While the forecast itself was made after the end of the financial year, the data available to base certain elements of our forecast were still the mid-year estimates from local authorities from 2017-18. One example is the data available on mandatory reliefs and as a result our 2017-18 forecast and associated forecast error for these was unchanged.

Conclusions

3.60 We can expect that on average, the NDR forecast error, expressed as a percentage, will be smaller than for other taxes, owing to the larger and relatively more stable tax base. While our proportional errors may be relatively modest, our errors expressed in monetary amounts will be relatively larger.

3.61 Our forecast error was due in large part to too high a forecast for gross income. One third of this can be attributed to our buoyancy forecast, which we have amended as part of our May 2018 forecast. Our forecast for Empty Property Relief was also a significant contributor to our forecast error and we will be reviewing our methodology and assumptions as we head into our Budget 2019-20 forecasts.

3.62 NDR is subject to a number of particular uncertainties. We expect that in the future, the major sources of forecast error will most often come from unanticipated losses due to appeals and errors related to changes in Government policy. While we may be able to reduce some of these before the fact, the experience of the Scottish Government shows that it is unlikely that we will be able to substantially address these challenges.

Land & Buildings Transaction Tax

3.63   Land and Buildings Transaction Tax replaced Stamp Duty Land Tax (SDLT) in Scotland from April 2015. The Additional Dwelling Supplement (ADS) was introduced in April 2016.

3.64   LBTT is paid on the purchase or lease of property and land. The components of LBTT are: residential, ADS and non-residential (commercial). We forecast each of these components separately.

3.65   The Commission forecasts LBTT on the accruals basis to best match that used in Revenue Scotland's Annual Report and Financial Statements.[42] This evaluation is carried out using provisional pre-audited figures for revenue raised provided by Revenue Scotland. We also use data on a similar basis for prices and transactions.[43] It is important to note that the Annual Report accounting basis is different to that used in the figures published each month by Revenue Scotland, in particular for ADS. Box 3.2 has further details.

Box 3.2: The accounting treatment of LBTT revenue raised

We forecast the amount of LBTT revenue raised, reported in the Annual Report and Financial Statements for the Devolved Taxes produced by Revenue Scotland each year. This figure is compiled on an accruals basis that reflects the tax declared due in a given financial year.

The Annual Report figure is based on the tax returns that are received by Revenue Scotland between 1 April, the start of a financial year, and 31 March, the end of the financial year, which relate to property transactions that completed within that financial year. Revenue Scotland then adjust this figure to take account of returns received in April or May following the end of the financial year for transactions that completed before the end of the relevant financial year.[44]

The case of ADS repayments merits particular attention. As per the other parts of LBTT, Revenue Scotland takes all the repayment claims submitted between 1 April and 31 March in the following year. This figure is then adjusted for claims received in April and May following the end of the relevant financial year where the sale of the previous main

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[42] For the most recent set of accounts at time of publication of this document, which is the 2016-17 report, please see here (link)

[43] These data, on an effective date basis, are published on the Revenue Scotland website in the "Data requests" section following the publication of our forecast and evaluation report documents (link)

[44] Note: in the case of the receipt of an amended tax return, Revenue Scotland will accrue this to the effective date of the amended return and will attribute the money difference between the amended and original return to the financial year in which the amendment took place.

residence falls into the period 1 April to 31 March. In loose terms, the repayment is attached to the date that the second home is sold.

Independently of the Annual Report and Financial Statement, Revenue Scotland publishes monthly LBTT statistics, which are based on the original date of receipt of tax returns. ADS repayments are reported against the month in which the return for the original transaction was received, hence monthly ADS figures in the statistics are revised as further ADS reclaims are received. The reasons for publishing on this basis are that it allows for timely publication of data (approximately two weeks after month end), that the data is relatively straightforward to quality assure and that that in the case of ADS, it allows users to track ADS, and subsequent reclaims, by monthly cohorts.

These statistics are different from the Annual Report in a number of important respects. First, apart from ADS repayments, the Annual Report apportions LBTT to the date of completion of the transaction, rather than the date when the tax return was received.[45] While the period between the date of completion of a transaction and date of receipt of the tax return is typically only three days, it can have important implications for the data around the time of a policy change. This is because of transactions being completed just before the end of one financial year, in order to avoid incurring a higher rate of tax in the next.

Second, for ADS repayments, the Annual Report accounts for the repayment in the year in which the claim (and associated transfer of main residence) occurred.[46] This means that in the Annual Report, the figure for repayments depends only on claims that have been received up until the end of the financial year. In the monthly statistics, ADS repayments are matched to the date that the tax return for the original additional home purchase was received. Claims received in the months and even years after the financial year-end will still affect the financial year figure for ADS repayments. Thus we would expect to see the net ADS figure (gross ADS less repayments) in the monthly statistics decrease over time as further claims for repayment are submitted.

Third, the monthly statistics are compiled under the Code of Practice for Official Statistics rather than the audited accounts, which are prepared according to the Government Financial Reporting Manual.[47]

For all of the above reasons, the Commission requests and receives data from Revenue Scotland on the basis of date of completion (or effective date) of property transactions three times per year.[48] For LBTT excluding ADS repayments, this enables us to move our price and transactions forecasts closer to the basis used in the Annual Report. In the case

[45] Recall from earlier that the Annual Report also assigns LBTT from returns received in April and May that refer to transactions that were completed before 1 April. There is also a technical point that any amendments to LBTT returns that are received before the end of May cut-off point, which refer to transactions that took place before the end of the financial year will also be included in this financial year. Note that these may relate to transactions that took place well before the financial year in question.

[46] Recall from earlier that the Annual Report makes an adjustment for claims received in April and May which refer to transfers of main residence occurring before the end of 1 April.

[47] HM Treasury (2016) Government financial reporting manual 2017 to 2018 (link)

[48] These data are requested ahead of each of our forecasts and our annual evaluation and can be viewed in the "Data Requests" section of the Revenue Scotland website's statistics page (link)

of ADS repayments, while not exact, our model is built in such a way as to mimic the manner in which the Annual Report accounting works. The data used as the basis for this calculation are provided within the spreadsheets published on the statistics data requests section of Revenue Scotland's website.

We would advise users of our forecasts to bear these distinctions in mind when assessing the accuracy of our LBTT forecasts.

Summary of forecast error

3.66   December 2017 marked the Commission's first forecasts in our statutory role. We now have provisional, pre-audited outturn data for 2017-18, which enables us to evaluate our in-year forecast. We cannot yet evaluate our forecasts a full year ahead and therefore we continue to include an assessment of the Scottish Government's forecasts made in December 2015 and 2016 and draw comparisons with the OBR's LBTT forecasts.[49] It will be a number of years before we are able to draw robust conclusions about any systematic forecasting errors in our own work.

3.67   Our overall forecast for total LBTT (residential, ADS and non-residential) in 2017-18 was £557 million, which is the same as the outturn figure. The residential forecast (excluding ADS) produced a five per cent overestimate, the non-residential forecast a five per cent underestimate and the ADS forecast saw a two per cent underestimate. These individual forecast errors cancelled out.

Table 3.7: LBTT forecast errors for 2017-18

	Outturn (£ million)	SFC December 2017 (£ million)	Relative error (%)
Residential (excl ADS)	258	271	5.1
Additional Dwelling Supplement	95	93	-2.1
Non-residential	204	193	-5.3
Total LBTT	557	557	0.0

Source: Scottish Fiscal Commission (2017) Scotland's Economic and Fiscal Forecasts – December 2017 (link), Revenue Scotland provisional and pre-audit Annual Report data. Figures may not sum because of rounding.

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[49] Scottish Government forecasts made in December 2015 (link), December 2016 (link) and OBR forecasts made in November 2017 (link)

Understanding our forecast error

Residential

3.68 Our December 2017 forecast of £271 million for residential LBTT in 2017-18 was £13 million (or five per cent) higher than the outturn figure. As Figure 3.7 shows, the main source of this error came from an overestimate of the number of property transactions. Had our transactions forecast matched the outturn figure, our revenue forecast would have been lower by £15 million. The second source of error was from our forecast for mean and median prices. Had these matched the outturn for 2017-18, our revenue forecast would have been higher by £3 million. The remaining components of our forecast contributed only a minor amount to the overall error.

Figure 3.7: Decomposition of the residential LBTT forecast error for 2017-18
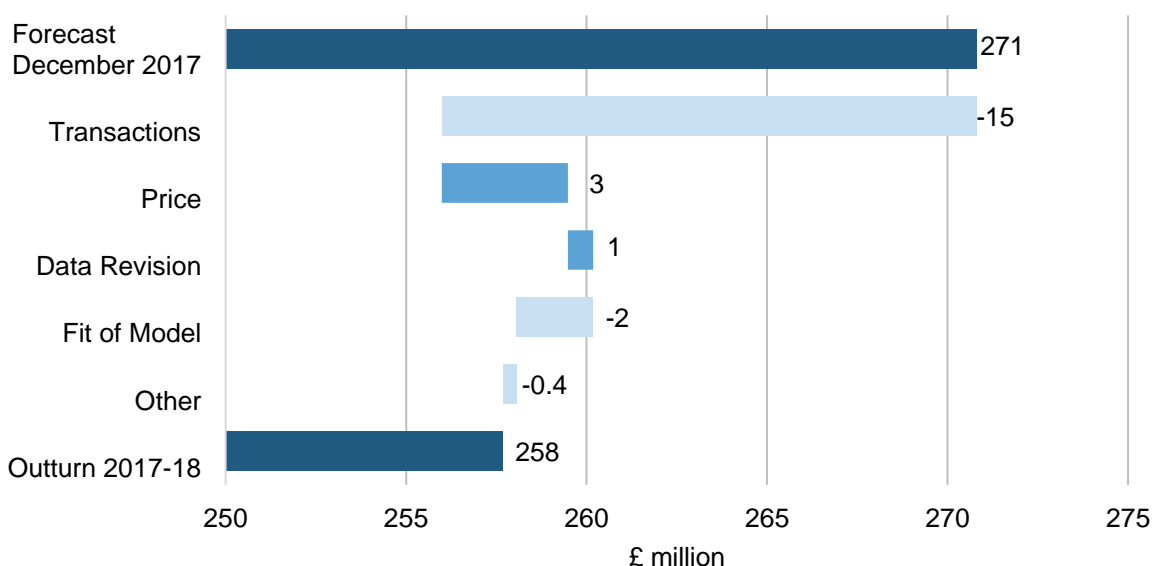
Source: Revenue Scotland provisional and pre-audit Annual Report data, Scottish Fiscal Commission (2017) Scotland's Economic and Fiscal Forecasts – December 2017 (link). Figures may not sum because of rounding.

3.69 The overestimate of transactions in our forecast can be attributed to a fall in the number of transactions in the second half of 2017-18, contrary to our expectation of a rise. This meant that our forecast of 107,600 transactions was 4,000 above the total for the financial year. The fall was driven by transactions valued at £250,000 and below, which made up 81 per cent of transactions in 2017-18. There was an increase in the number of transactions valued above £250,000. A key judgement for our forthcoming forecasts will be the extent to which we believe the observed fall may persist or broaden to the entire market.

3.70 Our forecasting approach is based on estimating the distribution of property transactions and includes adjustments made to account for known deviations between our estimates and subsequent outturn data. Following our last

Forecast Evaluation Report, we conducted a series of tests to see whether our estimated distribution provides a reasonable approximation to the observed distribution of transactions in 2017-18.[50] As in our last report, we find that the model passes these tests for the distribution of transactions as a whole, but fails for transactions at the very top end of the distribution.

3.71 We have assessed whether our adjustments made to revenue raised in each tax bracket as a result of these known deviations from our estimated distribution remain reasonable. Following our previous evaluation report, we have verified that while the scale of the adjustments is slightly different in 2017-18 from the previous two years, the direction of the adjustments remains the same.

Figure 3.8: Distribution of Scottish property transactions in 2017-18 & SFC model approximation
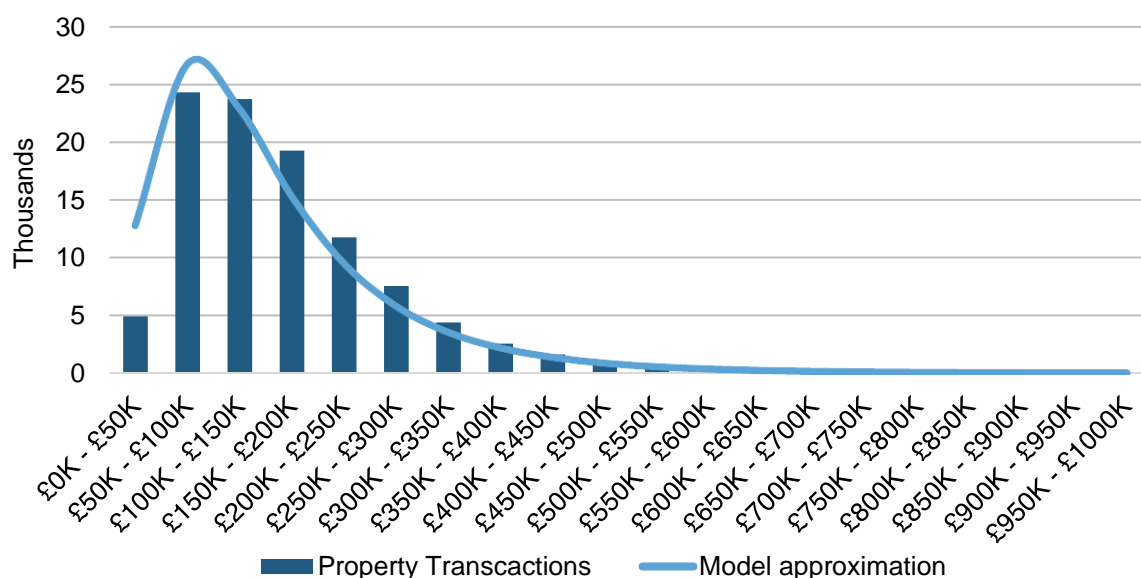
Source: Revenue Scotland (2018) Effective date basis data provided for forecast evaluation (link), Scottish Fiscal Commission.

Additional Dwelling Supplement

3.72 Figure 3.9 shows the drivers behind our £2 million (or 2.1 per cent) forecast error for net ADS revenues in 2017-18. The ADS forecast is derived from the residential LBTT price and transactions forecasts, so the same overestimate of transactions that drove the residential forecast error also applies to ADS. The other significant source of error was an overestimate of the rate at which ADS would be reclaimed. Had the transactions forecast been the same as the outturn, the revenue forecast would be lowered by £6 million, while in the

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[50] For further detail on the estimate of the distribution, see Scottish Fiscal Commission (2017) Forecast Evaluation Report (link)

case of the repayment rate, the revenue forecast would have been raised by £5 million.

Figure 3.9: Decomposition of the net ADS forecast error for 2017-18 (£ million)
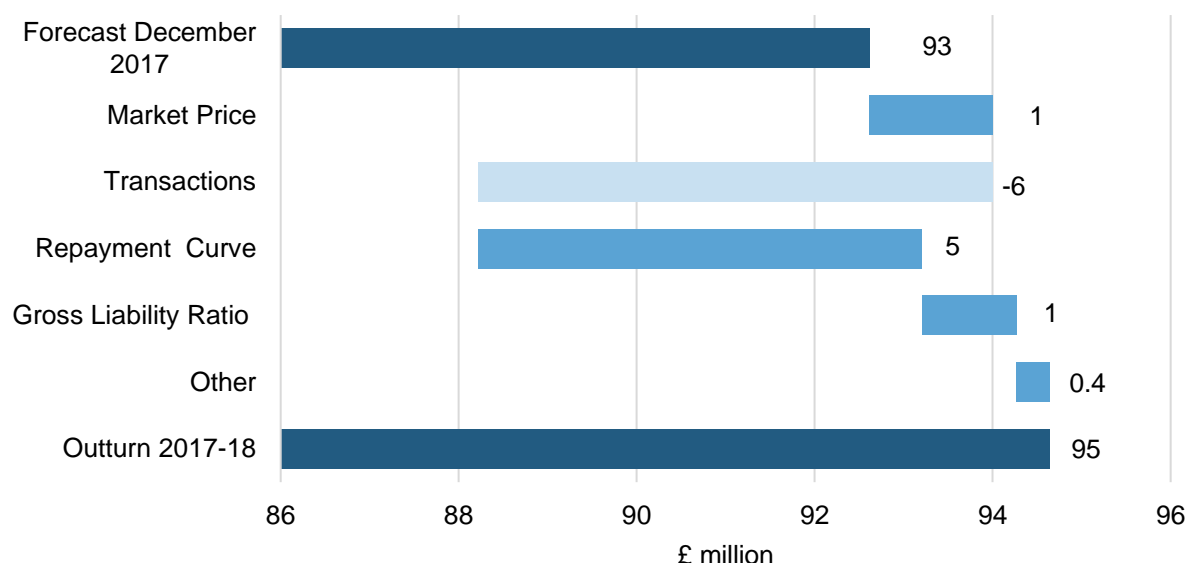
Source: Revenue Scotland provisional and pre-audit Annual Report data, Scottish Fiscal Commission (2017) Scotland's Economic and Fiscal Forecasts – December 2017 (link). Figures may not sum because of rounding.

3.73 ADS can be reclaimed within five years of purchasing an additional property if the purchaser sells their previous main residence within 18 months of purchasing the additional property. Our estimates of the proportion of ADS that is reclaimed and the timings of the reclaims can have a significant impact on the ultimate accuracy of our forecast. At the time of our previous Forecast Evaluation Report we only had data for the first year of the ADS restricting us to conducting a partial evaluation about the shape of the repayments curve. While we still do not have sufficient data to be conclusive, as the first year of ADS may not be representative of subsequent years, we can offer a better evaluation about the expected shape of the repayments curve. As Figure 3.10 shows, our projection of a repayment rate of 30 per cent of gross ADS repaid after 18 months was five percentage points too high, given currently available data. Our May forecast updated our repayment rate projection to 26 per cent.

Figure 3.10: Liabilities repayment curve – monthly rates
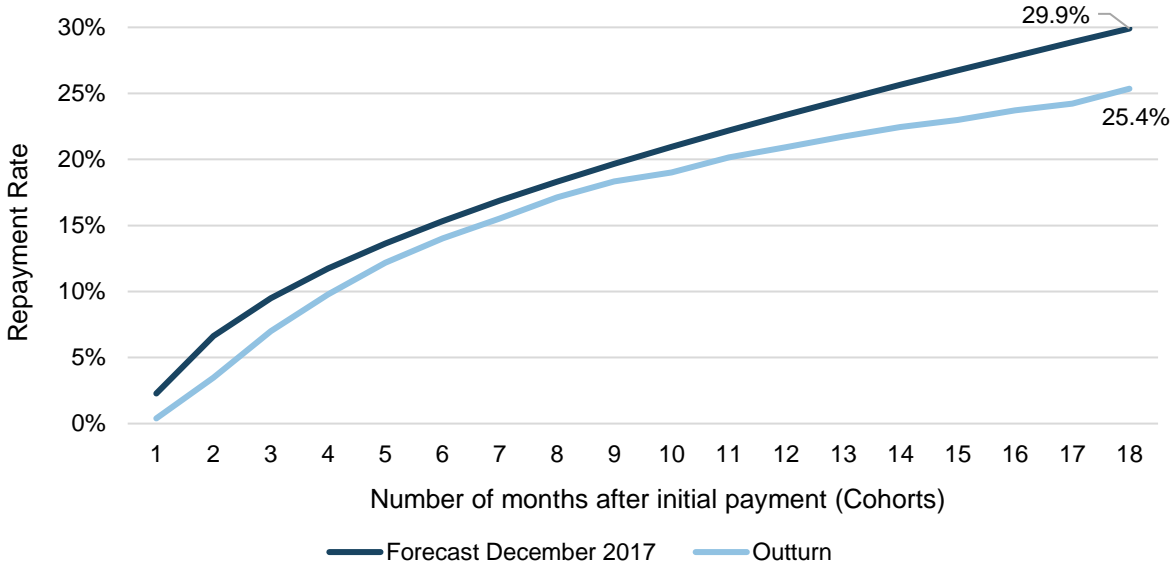
Source: Revenue Scotland (2018) Effective date basis data provided for forecast evaluation (link), Scottish Fiscal Commission (2017) Scotland's Economic and Fiscal Forecasts – December 2017 (link)

Non-residential

3.74   Our December 2017 in-year forecast for 2017-18 was constructed by applying the average pattern of monthly revenues observed in the previous two financial years to the available outturn revenue (financial year to October).[51] Thus, the entire forecast error is because of the deviation from that average during 2017-18, particularly in January 2018. Our forecast of £193 million was five per cent lower than the outturn figure of £204 million.

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[51] Using data from Revenue Scotland on an effective date basis published for forecast evaluation (link)

Figure 3.11: Monthly non-residential LBTT tax revenue, data available in December 2017 and latest data

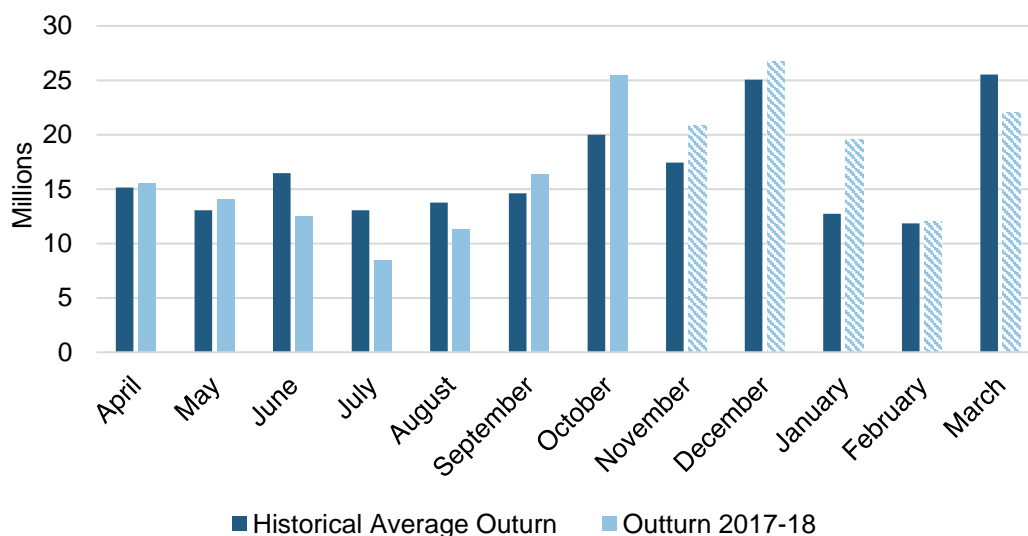Source: Revenue Scotland (2018) Effective date basis data provided for forecast evaluation (link), Scottish Fiscal Commission (2017) Scotland's Economic and Fiscal Forecasts – December 2017 (link).
Note: Shaded bars denote outturn data now available, but not available at the time our forecasts were produced in December 2017.

3.75   While maintaining a similar approach for building our in-year forecast, we have developed the non-residential model considerably since December 2017.[52] As of our May 2018 forecast, our approach is based entirely on Scotland specific data on revenues, transactions and prices. We model the distribution of non-residential purchases and include an adjustment to reflect revenue from lease transactions. Our price and transactions forecasts are determined in the short-term by statistical models and in the latter part of our forecast by our forecast for the Scottish economy. We will be using this approach again in our future forecasts.

Scottish Government and OBR forecasts

3.76   This section compares our forecast errors with those of the Scottish Government and the Office for Budget Responsibility.[53]

3.77   Table 3.8 shows the forecasts made for 2016-17 and 2017-18 by the Scottish Government and the OBR alongside our December 2017 forecasts for 2017-18. The Scottish Government's December 2016 forecast for LBTT in 2017-18 (excluding ADS) was £435 million, a £27 million underestimate. This was driven by an 18 per cent underestimate of residential revenue and a nine per

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[52] For further detail, see Scottish Fiscal Commission (2018) Scotland's Economic And Fiscal Forecasts – May 2018, page 131, paragraph 3.101 (link)

[53] Scottish Government Mont forecasts made in December 2015 (link), December 2016 (link) and OBR forecasts made in November 2017 (link)

cent overestimate of non-residential LBTT. The OBR's November 2016 LBTT forecast of £485 million in 2017-18 yielded a £23 million overestimate.

3.78 It is not yet possible to perform an analysis for ADS, as the Scottish Government's forecasts accrued all refunds back to the date of the original transactions (see Box 3.2 on different accounting basis), meaning that we do not yet have final figures for 2016-17 or 2017-18.

Table 3.8: Summary of Scottish Fiscal Commission, Scottish Government and OBR Forecasts for LBTT (£ million)

£ millions	2015-16	2016-17	2017-18
Outturn (excluding ADS)	425	391	462
SFC (Dec-2017)			464
OBR (Nov-2017)			453
Scottish Government (Dec-2016)		357	435
OBR (Nov-2016)		419	485
Scottish Government (Dec-2015)	435	502	578
OBR (Nov-2015)	356	496	557
Outturn (including ADS)		484	557
SFC (Dec-2017)			557
OBR (Nov-2017)			552

Sources: OBR (2015) Devolved Tax Forecast November 2015 (link), OBR (2016) Devolved Tax Forecast November 2016 (link), OBR (2017) Devolved Tax Forecast November 2017 (link), Scottish Fiscal Commission (2016) Outturn Report 2015-16 (link), Scottish Fiscal Commission (2016) Report on Draft Budget 2017-18 (link), Scottish Fiscal Commission (2017) Scotland's Economic and Fiscal Forecasts – December 2017 (link), Scottish Government (2015) Draft Budget 2016-17 (link), Scottish Government (2016) Draft Budget 2017-18 (link) Revenue Scotland Annual Report 2015-16 (link), Revenue Scotland Annual Report 2016-17 (link), Revenue Scotland provisional and pre-audit Annual Report data. Figures may not sum because of rounding.

Note: The Scottish Government's in-year forecasts made in December 2015 (forecast for the year 2015-16) and in December 2016 (forecast for the year 2016-17) are not official Government forecasts and were not published in the Draft Budget documents. However, these forecasts were produced at the time of each Draft Budget and provide useful information for this assessment.

3.79 The OBR's in-year forecast in November 2017 was produced one month prior to ours.[54] The forecast for total LBTT was £552 million, £5 million lower than outturn. The residential forecast (excluding ADS) produced a six per cent overestimate, the non-residential forecast a 12 per cent underestimate and the ADS forecast saw a four per cent overestimate.

3.80 Table 3.9 compares our in-year forecast error from December 2017 in percentage terms for the residential and non-residential components of LBTT

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[54] OBR (2017) Devolved Tax Forecast November 2017 (link)

and for LBTT excluding ADS.[55] The scale of our forecast errors appear to be in line with those of others, although we would caution that it will be several years before we can come to any firm conclusions about the relative average forecast errors being made.

Table 3.9: In-year forecast errors (per cent difference from outturn)

	Residential (excl. ADS) (%)	Non-residential (excl. ADS) (%)	LBTT (excl. ADS) (%)
Scottish Fiscal Commission (Dec 2017)	5.1	-5.3	0.5
OBR (Nov 2017)	6.3	-12.4	-1.9
Scottish Government (Dec 2016)	-15.3	28.8	4.7
OBR (Nov 2016)	7.1	7.4	7.2
Scottish Government (Dec 2015)	9.2	-4.1	2.4
OBR (Nov 2015)	-14.4	-18.0	-16.2
Average absolute error	9.6	12.7	5.5

Sources: OBR Devolved Tax Forecast November 2015 (link), OBR Devolved Tax Forecast November 2016 (link), OBR Devolved Tax Forecast November 2017 (link), Scottish Government Draft Budget 2016-17 (link), Scottish Government Draft Budget 2017-18 (link), Scotland's Economic and Fiscal Forecasts (2017) (link). Figures may not sum because of rounding.

Note: The Scottish Government in-year forecasts made in December 2015 (forecast for the year 2015-16) and in December 2016 (forecast for the year 2016-17) are not official Government forecasts and were not published in the Draft Budget documents. However, these forecasts were produced at the time of each Draft Budget and provide useful information for this assessment.

3.81 The SG and OBR average absolute errors for the overall in-year forecasts were six per cent, while for the year ahead forecasts they were 17 per cent. This illustrates a key challenge for our current and future forecasts of LBTT. Given the combination of the progressive structure of the tax, a relatively small tax base and the potential for unanticipated developments following any forecast, we should expect:

- Forecast errors will increase over the forecast horizon.

- The accuracy of in-year forecasts will vary from forecast to forecast.

3.82 We have previously highlighted the importance of the forecast for house prices in driving the forecast errors.[56] The forecast for house prices accounted for a large proportion of the forecast error in 2017-18 in Scottish Government residential LBTT forecasts and also played a significant role in

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[55] We exclude ADS as the Scottish Government and the OBR forecast ADS on a different accounting basis to the one we use. The former in particular prevents a like-for-like comparison, while the latter uses an accounting basis that is much closer to the one we follow.

[56] See discussions in Scottish Fiscal Commission (2017) Forecast Evaluation Report 2017 (link) and Scottish Fiscal Commission (2017) Scotland's Economic and Fiscal Forecasts December 2017 (link)

the OBR's. Due to the progressive nature of the tax, a key risk with forecasting revenues is that consistently high or low forecast errors will be compounded over the forecast horizon. This risk was also important for the Scottish Government's non-residential forecasts, with a cumulative seven percentage point overestimate in the December 2015 forecast and a five percentage point underestimate in the December 2016 forecast rate of growth.

3.83 The OBR's non-residential forecast error was almost entirely driven by a six percentage point underestimate of average commercial property price growth in Scotland in 2017-18. This is another example of the fact that non-residential prices (and hence revenues) are extremely volatile from year to year. It is helpful to recall that 50 per cent of non-residential LBTT comes from the top three per cent highest valued purchase transactions.

3.84 We are able to make a comparison of our own ADS forecast with the one that the OBR made in November 2017.[57] Similarly to ours, the OBR's errors for the ADS were driven by price and transactions growth forecasting errors. However, the OBR's assumption of 25 per cent of gross ADS being reclaimed is closer to the current outturn data than our own. Our differing assumptions stemmed from our use of a statistical model based on available data at the time, while the OBR's assumption was a judgement based on initial reports of intentions to reclaim.

May 2018 forecasts

3.85 Our forecast for LBTT made in May 2018 included an in-year forecast for 2017-18, based on eleven months of data. Our forecast of £550 million was £6 million or 1.1 per cent lower than outturn. This was a larger forecast error than the one from our December forecast. While our forecast errors of 0.4 per cent for residential and -1.8 per cent for non-residential LBTT were significantly lower than in our December forecast our ADS forecast error of -3.9 per cent was larger.

3.86 As these forecasts were largely based on outturn data, part of the error can be attributed to our use of data on a slightly different accounting basis to the one used in the Revenue Scotland Annual Report. The larger overall error despite more data also points to two important issues. The first is that we should expect to make a forecast error in our May forecasts, even with most of a year's worth of data available. Secondly, owing to separate forecasts for

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[57] In November 2016, the OBR's ADS forecast was made using the ONS accounting basis that is similar, although not identical to that in the Revenue Scotland Annual Report, from the basis that was consistent with the Scottish Government's approach. This enables us to compare our LBTT forecasts, including ADS, with those of the OBR.

each of the components of LBTT, we can expect that our errors will not usually cancel out when the forecasts are aggregated.

Conclusions

3.87 At this early stage, we must be cautious in the conclusions we can draw from the short-term performance of a single set of forecasts. LBTT revenue typically varies considerably from year-to-year.

3.88 We continue to assess our approach to forecasting and our forecast models as reasonable, taking into account the evaluation just carried out. We updated our non-residential model as part of our May forecast and will make an initial assessment of its forecasting performance in next year's report. We are not planning any further major developments to our forecast models between now and Budget 2019-20.

3.89 We will continue to monitor data as they become available. In our next forecasts we will re-examine our forecast for the repayment rate for ADS, and consider the extent to which the fall in residential transactions seen in the second half of 2017-18 will continue in 2018-19.

Scottish Landfill Tax

3.90　Scottish Landfill Tax (SLfT) is a tax on the disposal of waste to landfill. Since 1 April 2015 Revenue Scotland has collected and managed revenue for the newly created SLfT, which replaced the previous UK-wide tax in Scotland.

3.91　SLfT is an environmental tax, designed to encourage efforts to minimise the amount of waste produced and incentivise the use of non-landfill waste management options. Figure 3.12 below shows the standard rate of tax alongside the tonnage of standard rate waste being landfilled at the UK level between 1999-00 and 2017-18. As the rate of tax has risen the volume of standard rate waste landfilled has fallen.

Figure 3.12: Standard rate of tax and standard rate waste landfilled in the UK (1990-00 to 2017-18)
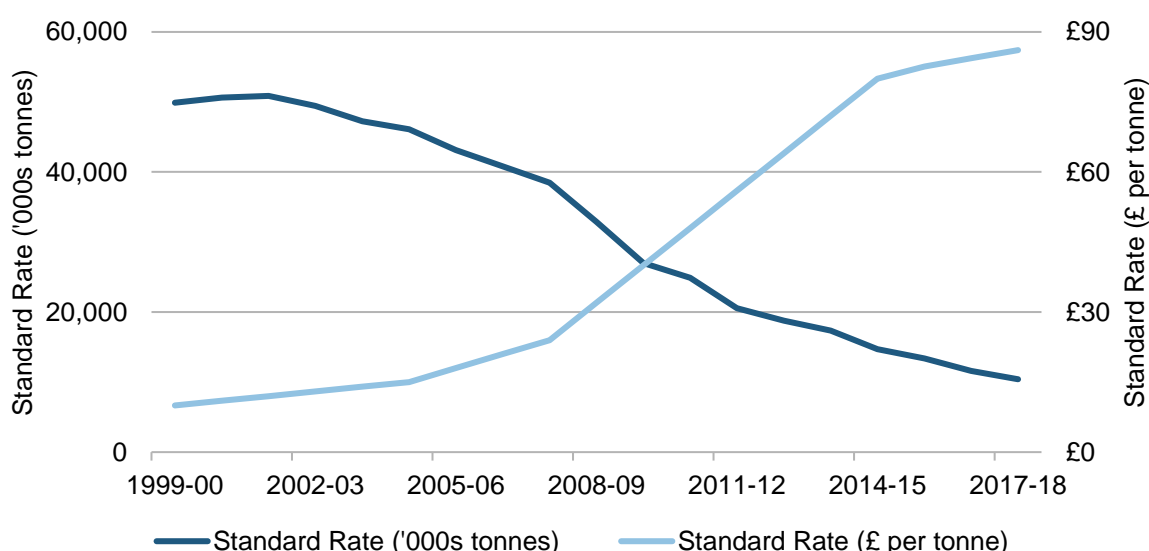
Source: HMRC Landfill Tax bulletin April 2018 (link), Revenue Scotland, Scottish Landfill Tax Statistics Q4 2017-18 (link)

Summary of forecast error

3.92　Provisional pre-audit data from Revenue Scotland show SLfT receipts of £148 million in 2017-18. This compares to a forecast of £137 million made by the Commission in December 2017, an underestimate of £11 million for the year, and an absolute forecast error of eight per cent. A summary of how this error compares to forecasts made by the Commission and the OBR at different points in time is given in Table 3.10 below. For additional context, Tables 3.11 and 3.12 present historic SG and OBR average in-year forecast errors against outturn Scottish and UK Landfill Tax respectively. A similar presentation will be adopted for evaluating the Commission's SLfT forecasts in future Forecast Evaluation Reports.

Table 3.10: SLfT forecasts and tax raised for 2017-18 (£ million)

	Forecast	Tax raised	Absolute difference	Absolute % difference
SFC May 2018	142	148	6	4.4%
OBR Mar 2018	142	148	6	4.0%
SFC Dec 2017	137	148	11	8.1%
OBR Nov 2017	140	148	8	5.7%
SG Dec 2016	149	148	1	0.5%

Source: Scottish Fiscal Commission (2018) Scotland's Economic and Fiscal Forecasts May 2018 (link), OBR (2018) Devolved Taxes Forecast March 2018 (link), Scottish Fiscal Commission (2017) Scotland's Economic and Fiscal Forecasts December 2017 (link), OBR (2017) Devolved Taxes Forecast November 2017 (link), Scottish Government (2016) Devolved Taxes Methodology 2017-18 (link), Revenue Scotland provisional and pre-audit Annual Report data. Figures may not sum because of rounding.

3.93 Table 3.10 shows that we improved our forecast of 2017-18 SLfT receipts in our May 2018 publication. The difference reducing to £6 million for the year, and an absolute percentage error of 4.4 per cent. In December 2017, only one quarter of outturn data on the amount of standard and lower rate waste being landfilled was available for the 2017-18 in-year forecast. By May 2018, additional outturn data had been published by Revenue Scotland and we were able to use data for the first three quarters of the year to produce a revised in-year forecast.

3.94 Compared to the December 2017 forecast, receipts for standard rate waste were approximately £10 million higher than expected, contributing by far the largest source of error. While lower rate waste was 20 per cent lower than forecast, this had a minimal impact on total revenue, estimated to be around £0.5 million.

Table 3.11: Scottish Government historic average in-year forecast error of SLfT (£ million)

		£ million	Relative forecast error (%)
Historic (2015-16 to 2016-17)	Average error	-2	-1.2
	Average absolute error	3	2.1

Source: Scottish Fiscal Commission (2016) Outturn Report 2015-16 (link), Scottish Fiscal Commission (2016) Report on Draft Budget 2017-18 (link)

Note: The in-year forecasts made in December 2015 (forecast for the year 2015-16) and in December 2016 (forecast for the year 2016-17) are not official Government forecasts and were not published in the Draft Budget documents. However, these forecasts were produced at the time of each Draft Budget and provide useful information for this assessment.

Table 3.12: OBR historic average in-year forecast error of UK landfill tax (£ billion)

		£ billion	Relative forecast error (%)
Historic (2010-11 to 2016-17)	Average error	0.04	4.2
	Average absolute error	0.08	7.7

Source: OBR Forecasts in depth: Landfill Tax – previous forecasts data download ([link])

3.95 The Scottish Government's December 2016 forecast of SLfT revenue was £1 million higher (an absolute percentage error of 0.5 per cent) than the provisional pre-audit amount. This forecast was based on the Scottish Government's in-year forecast for 2016-17 of £150 million – £2 million higher than outturn. The Scottish Government then applied a more substantial 2017-18 incineration capacity assumption which has since been revised down at subsequent fiscal events, the combination of the higher baseline and higher assumed volume of waste diverted to landfill resulted in an overall forecast error which was small.

Understanding our forecast error

3.96 The methodology adopted by the Scottish Government in December 2016 is very similar to the model now owned and utilised by the Commission. One difference relates to how the baseline tonnage is scaled up using quarterly shares based on available outturn data. The Government forecast used the quarterly pattern from 2015-16 taxable tonnages to scale up available data covering 2016-17 to a full year, which was then held constant over the forecast horizon. Our December 2017 forecast used UK average seasonal share data from HMRC landfill statistics prior to devolution and assumed the pattern would be the same in Scotland in 2017-18. The difference between the HMRC average share of standard rate waste in the first quarter and the actual quarterly share was 1.5 percentage points. While this is small it can represent several million pounds due to the forecast overestimating the decline in landfilled waste.

Table 3.13: Comparing SFC and SG 2017-18 standard rate forecasts

	SFC Dec 2017 (tonnes)	SG Dec 2016 (tonnes)
Baseline estimate	1,667,045	1,861,736
Incineration estimate [58]	13,669	60,750
Baseline net incineration [59]	1,653,923	1,803,416
Percentage difference to RS published figure (1,765,400 tonnes)	-6.3%	2.2%

Source: Scottish Fiscal Commission (2017) Scotland's Economic and Fiscal Forecasts December 2017 (link), Scottish Government (2016) Devolved Taxes Methodology 2017-18 (link). Revenue Scotland Q4 2017-18 SLfT Statistics (link). Figures may not sum because of rounding.

3.97 The difference between incineration estimates used by the Commission and the Scottish Government results from timing differences in acquiring the information. The projected incineration capacity used by the Scottish Government was estimated based on the available information at the time their forecast was produced back in December 2016, whereas the Commission's forecast was based on the data available in December 2017. This more recent information included an update from SEPA which confirmed a delay to the construction of one of the sites. This resulted in our projections of incineration capacity being reduced for 2017-18.

3.98 The OBR also produces a forecast of SLfT, published as part of its Devolved Taxes Publication. As detailed in their most recent publication, the OBR now use largely the same model as the Commission for forecasting SLfT, leading to only very slight differences between our forecasts.[60]

3.99 We note that our forecasts performed slightly worse than the OBR forecasts of 2017-18 SLfT receipts. Minor variances between the Commission and OBR in-year baseline forecasts are a result of slightly different methods used to scale up available outturn data.

3.100 We will look to further refine the seasonal share used to generate the in-year estimate, given its importance in setting the baseline for subsequent years. While there was no evidence of significant seasonality in the 2015-16 data, outturn data for 2016-17 showed a slight spike in the amount of standard rate waste going to landfill in the first and second quarters of the financial year. This observation has continued in 2017-18. Although similar patterns are

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[58] Assumes incinerators operate at 90 per cent of consented capacity

[59] Assumes incineration results in four per cent of residue waste landfilled at Standard Rate

[60] OBR (2018) Devolved Taxes and Spending Forecasts March 2018 (link)

observed in HMRC data at a UK level, the Commission will consider whether it should now adopt Revenue Scotland quarterly shares to scale up baseline data. While the differences in quarterly share of standard rate waste are relatively small between sources, with three years of Revenue Scotland outturn data now available, it may be appropriate to use Scotland specific average shares as opposed to HMRC averages. Table 3.14 summarises the quarterly shares from Revenue Scotland and HMRC.

Table 3.14: Share of standard rate tonnages by quarter (%)

Quarter	Revenue Scotland 2016-17	Revenue Scotland 2017-18	Revenue Scotland 3-year average (2015-16 to 2017-18)	HMRC 10-year average (2006-07 to 2015-16)
Apr-Jun	26.2%	24.9%	25.5%	26.4%
Jul-Sep	26.5%	26.0%	25.9%	26.4%
Oct-Dec	24.1%	24.2%	24.3%	24.3%
Jan-Mar	23.2%	24.8%	24.3%	22.9%

Source: Revenue Scotland SLfT Statistics January to March 2017 (link); HMRC Landfill Tax bulletin April 2017 (link)

3.101 The timing and size of additional incineration capacity is a key factor in determining the amount of waste being landfilled. The Commission has worked with experts within the Scottish Environment Protection Agency (SEPA) to ensure these projections of future incinerator capacity are up-to-date and, as far as possible, reflect the likely timescales for such facilities coming on line. Notification of a delay to the full rate operation of the first site to increase incineration capacity resulted in a £0.9 million increase to the 2017-18 SLfT revenue forecast between our December 2017 and May 2018 publications.

3.102 Our forecasts are produced based on the quarterly data available from Revenue Scotland, this is a slightly different accounting basis used in Revenue Scotland's Annual Report and Accounts.[61] We will review whether we need to adjust our approach given the apparent relatively small discrepancies between the two sources.

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[61] This evaluation is carried out using provisional pre-audited figures for revenue raised provided by Revenue Scotland. The figures in Revenue Scotland's Annual Report and Accounts are based on tax returns and amendments submitted during the financial year and adjusted for the value of SLfT returns received during the following April and May which relate to the period up to the 31 March 2018. This may include adjustments to returns originally submitted in previous financial years. Quarterly data available from Revenue Scotland is based on total self-reported tax payable on returns relating to the given quarter.

Conclusion

3.103   The Commission's December 2017 forecast underestimated SLfT revenues by £11 million for 2017-18. The most significant factor in this error was too low a forecast for the level of standard rate waste, which was because of the anticipated decline in landfill tonnages occurring at a slower rate than forecast.

3.104   The Revenue Scotland 2017-18 Q1 figure was used to generate the 2017-18 estimate published by the Commission in December 2017. This accounted for a smaller share of annual standard rate waste than the previous year, and also a smaller share than the HMRC average used to scale up the data for the baseline year. With three years of Revenue Scotland outturn data now available, the Commission will consider where it should use Scotland specific average shares as opposed to pre-devolution HMRC UK-wide averages for scaling purposes in future forecasts.

3.105   While we have engaged with SEPA to ensure projections of capacity reflect intelligence available at the time, these are large complex construction projects that can encounter significant delays for a variety of reasons. This aspect of the forecast will continue to be reviewed and updated regularly, given the uncertainties involved with the precise start dates for these facilities.

Abbreviations

ADS	Additional Dwelling Supplement
APD	Air Passenger Duty
COE	Compensation of Employees
DWP	Department for Work and Pensions
GDP	Gross Domestic Product
HMRC	Her Majesty's Revenue and Customs
IFI	Independent Fiscal Institution
LBTT	Land and Buildings Transaction Tax
MYE	Mid-Year-Estimate
NDR	Non-Domestic Rates
NRS	National Records of Scotland
NSND	Non-Savings Non-Dividend
OBR	Office for Budget Responsibility
OECD	Organisation for Economic Co-operation and Development
ONS	Office for National Statistics
PUT	Public Use Tape
RS	Revenue Scotland
SDLT	Stamp Duty Land Tax
SEPA	Scottish Environmental Protection Agency
SDLT	Stamp Duty Land Tax
SFC	Scottish Fiscal Commission

SG	The Scottish Government
SLfT	Scottish Landfill Tax
SPI	Survey of Personal Incomes
QNAS	Quarterly National Accounts Scotland
VAT	Value Added Tax

A full glossary of terms is available on our website.[62]

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[62] Scottish Fiscal Commission Glossary of Terms ([link](#))

Voluntary compliance with the Code of Practice for Official Statistics

The Commission seeks to adhere to the highest standards for analysis possible. While we do not produce official statistics (we produce forecasts), the Commission and our work voluntarily complies as much as possible with the UK Statistic Authority's Code of Practice for Statistics. Further details and our statement of voluntary compliance can be found on our website.

Correspondence and enquiries

Press enquiries should be sent to press@fiscalcommission.scot or call Caroline Rham 0131 244 0929; Mob: 07974227021

For technical enquiries about the analysis and data presented in this paper please contact:

Economy	Silvia Palombi	Silvia.Palombi@fiscalcommission.scot
Income Tax	Chris Dunlop	Chris.Dunlop@fiscalcommission.scot
NDR & LBTT	Rupert Seggins	Rupert.Seggins@fiscalcommission.scot
SLfT	David Jack	David.Jack@fiscalcommission.scot

For general enquiries about the commission and how we work please contact info@fiscalcommission.scot