Scottish Budget
Draft Budget 2015-16
Devolved Taxes – Forecasting Methodology
INTRODUCTION

This paper provides an overview of the approach which the Scottish Government has taken in preparing the devolved tax revenue forecasts presented in the 2015-16 Draft Budget.

For the first time since devolution, the spending plans set out in the 2015-16 Draft Budget will be part-funded by revenues from two taxes established by the Scottish Parliament – Land and Buildings Transaction Tax (LBTT) and Scottish Landfill Tax (SLfT) – which will replace existing UK taxes under powers devolved by the Scotland Act 2012.

This paper sets out the modelling approach which we deployed in preparing the forecasts for each of the two devolved taxes. These forecasts have been reviewed and endorsed as reasonable by the independent Scottish Fiscal Commission, which has published its own report commenting on the approach which we have taken.

Land and Buildings Transaction Tax – Residential transactions

Modelling approach

The Scottish Government has developed a “bottom-up” model for residential transactions which is capable of forecasting tax revenue from both Stamp Duty Land Tax (SDLT) and Land and Buildings Transaction Tax (LBTT), under different tax rates and thresholds. This model is based on a log-normal distribution of house prices recorded for purchases in Scotland (see Figure 1 below) and draws on work undertaken to develop a model of Housing Need and Demand. As this distribution has been tested over a number of financial years, we can be analytically confident that it provides a sound basis for projecting the future distribution of housing transactions by number and value.

Figure 1: Distribution of housing sales in Scotland (2013-14)

Source: Registers of Scotland, Scottish Government Analysis

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1 The report of the Scottish Fiscal Commission is available at www.scottishfiscalcommission.org
The model smooths the spikes in the volume of transactions just below the current SDLT thresholds of £125,000 and £250,000, which are entirely a product of the slab nature of the existing tax. The smoothed distribution is represented by the red line in Figure 1. As such, the model will slightly overstate SDLT revenues, but not to a material degree. This issue will be even less material with LBTT as it will remove the distortions caused by the slab nature of SDLT.

The predictive capacity of the model in respect of “long-tail” events, i.e. very high value transactions (above c. £1,000,000, which represents a very small proportion of revenue), is somewhat weaker than for the main part of the distribution. In general the model can be expected to slightly underestimate the number of very high value transactions. This latter effect helps to build prudence into the model – it would not be prudent to rely on revenues from a small number of very high value transactions on an ongoing basis. Nevertheless, testing of this model using historic transactions and housing market data has shown that it can be used to calculate historic revenues with a high degree of precision (within 2-3% of actual revenues recorded by HMRC).

The log-normal is defined by the mean and median. This model then produces forecasts by calculating future revenues based on projected future movements in mean and median house prices and in the volume of transactions.

This approach has the advantage that it offers a single, consistent method of forecasting residential revenue for the existing UK tax (SDLT) and for the new Scottish tax (LBTT). The model takes account of non-linearities between the house price distribution and tax thresholds, which becomes particularly important as house prices rise relative to the thresholds. This means that the same model is effective in forecasting revenues from both SDLT and LBTT.

Residential price growth scenarios
We have projected future house prices using a combination of an ARIMA\(^2\) process in the short term and an equilibrium real-terms house-price growth rate in the long term. The ARIMA process is based on past values, with greater weight given to the more recent values. Thereafter, it is assumed that house-price growth converges to an average rate of 4.9%, which comprises 2.9% real-terms growth (in line with historic trends) and 2.0% inflation.

Our model considers the performance of the Scottish housing market only, and so eliminates the distortive effects (as far as Scottish forecasts are concerned) of very strong price growth in London and the South East. For example, the Scottish house-price index (HPI) was still 5% below the 2008 peak in April 2014. By contrast, the UK HPI has now recovered to 6% above its pre-crisis level, driven largely by increases in London where the HPI is now 32% above its pre-crisis peak.

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\(2\) An ARIMA approach to forecasting allows the modelling of a single stationary (loosely, a series that varies around a constant mean over time) variable, in this case house price growth rates. A forecast based on this modelling approach will predict how a series will return to its long term trend based on recent observations (or “lags”). Autoregressive (AR) and Moving Average (MA) are separate approaches to modelling time series that are combined in this approach. This model is ARIMA(2,0,1), implying that 2 lags of the time series are used in the AR element and only 1 lag of the series in the MA element. An ARIMA(1,0,2) specification was also tested, and although largely similar was found to have greater errors in out-of-sample forecasts.
Table 1 below summarises our residential price growth assumptions.

Table 1: Residential price growth assumptions

<table>
<thead>
<tr>
<th>Annual Growth (%)</th>
<th>2012/13</th>
<th>2013/14</th>
<th>2014/15</th>
<th>2015/16</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARIMA house prices and long term real house prices + 2% inflation</td>
<td>-1.3</td>
<td>2.0</td>
<td>5.0</td>
<td>5.3</td>
</tr>
</tbody>
</table>

Source: Scottish Government / OBR “Economic and Fiscal Outlook” (March 2014)

Our preferred scenario is a combination of what is considered the strongest theoretical long-run equilibrium and the most appropriate adjustment process to track short term movements from the current position towards that equilibrium. We have assumed that house price growth in Scotland will gradually return to its long run trend. Given volatility in house prices between years, we will continue to keep our assumptions of future growth under close scrutiny, comparing forecast with observed movements as soon as reliable data becomes available.

Residential transactions volume scenarios

Due to the sharp fall in transactions following the 2008 financial crisis, the annual turnover rate of residential properties is currently well below its long run average. Annual residential transactions are estimated to have been equivalent to 4.8% of the private sector housing stock in 2013/14. This compares to a long-run average of 6% between 2003 and 2012, a period covering both the housing boom and subsequent financial crisis. The Scottish Government forecast assumes that transaction levels continue to recover until the turnover rate returns to 6% towards the end of this decade. Thereafter both transactions and stock are assumed to grow by 2.2% per annum, maintaining the turnover rate at 6% of stock.

Our prediction is for annual growth in numbers of transactions of 7.4% and 6.9% in 2014-15 and 2015-16 respectively, over the previous year. This growth would see numbers of transactions in 2015-16 still markedly below the 2007 peak as demonstrated in Figure 2 below.

Figure 2: Residential Transactions – Scotland
Our annual growth projections are significantly lower than those of the OBR in 2014-15, but we forecast higher volume growth in 2015-16, as shown in Table 2 below. However, our projections show lower cumulative growth across the two year period 2014-16 – we forecast cumulative volume growth of 14.8% compared to the OBR’s 22.8%. Our approach reflects steadier growth in activity in the Scottish housing market and a significantly more prudent assumption for growth in 2014-15. The most recent data suggests that, in Scotland at least, the very rapid volume growth experienced during the 2013-14 recovery is beginning to settle down to more steady-state levels. This supports our forecast assumption that annual growth will now begin to converge to the long-run average but also illustrates the difficulties inherent in forecasting a volatile variable. As with house prices, given volatility in transaction volumes between years, we will continue to keep assumptions under close scrutiny, and will review forecasts in the light of actual data as soon as this is available.

Table 2: Summary of volume growth/scenarios

<table>
<thead>
<tr>
<th>Annual Growth (%)</th>
<th>2012/13</th>
<th>2013/14</th>
<th>2014/15</th>
<th>2015/16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual</td>
<td>forecast</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OBR</td>
<td>2.9%</td>
<td>19.7%</td>
<td>18.4%</td>
<td>3.7%</td>
</tr>
<tr>
<td>Scottish Government</td>
<td>2.9%</td>
<td>19.7%</td>
<td>7.4%</td>
<td>6.9%</td>
</tr>
</tbody>
</table>

Source: Scottish Government / OBR “Economic and Fiscal Outlook” (March 2014)

Land and Buildings Transaction Tax – Non-residential transactions

The modelling of revenue from non-residential transactions is more challenging owing to the heterogeneous structure of the tax base and the limited data available. As there is no clear distribution of non-residential transactions, it has not been possible to develop a “bottom up” model for forecasting SDLT revenues for non-residential transactions. Receipts are highly dependent on the nature of transactions in the final SDLT price band (the “top” rate of 4% is payable on transactions over £500,000) and commercial receipts are particularly volatile in a way that is difficult to explain even with hindsight. In light of these challenges, our modelling projects revenue forward based on fundamentals. This is similar to the approach used by the OBR.

Our forecast of revenues from non-residential transactions in Scotland is based on the OBR’s assumptions of growth in UK commercial property prices and the volume of such transactions, as reported in the March 2014 Economic and Fiscal Outlook and summarised in Table 3 below. A three year average of outturn receipts, rather than the latest outturn year, is taken as the baseline to which the OBR assumptions are applied as we believe this more prudently captures the volatility of receipts. The OBR assumptions reflect forecasts of future UK economic conditions. However, unlike the residential property market, recent trends in commercial property in Scotland and the rest of the UK have been broadly similar.

Table 3: Assumptions underlying OBR estimates of non-residential SDLT revenues

<table>
<thead>
<tr>
<th>Annual Growth (%)</th>
<th>2012/13</th>
<th>2013/14</th>
<th>2014/15</th>
<th>2015/16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual</td>
<td>forecast</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial property prices (%)</td>
<td>2.3%</td>
<td>11.9%</td>
<td>2.1%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Commercial property transactions (%)</td>
<td>1.5%</td>
<td>9.3%</td>
<td>3.9%</td>
<td>3.1%</td>
</tr>
</tbody>
</table>

Source: Scottish Government / OBR “Economic and Fiscal Outlook” (March 2014)
Scottish Landfill Tax (SLfT)

Modelling approach

The Scottish Government has produced a model for forecasting SLfT receipts which applies the actual or projected rate of tax to actual or projected volumes of waste disposals to landfill in Scotland. The projected trajectory of volumes of waste disposals is based on Scottish Government Zero Waste policy targets. We have tested these forecasts against UK LfT receipts reported by HMRC and applied an adjustment for the Landfill Communities Fund credit.

HMRC is unable to disaggregate LfT receipts from disposals to Scottish landfill sites from total UK receipts. This is because some taxpayers operate landfill sites in both Scotland and the rest of the UK and the tax returns do not distinguish between waste disposed of at, and therefore tax receipts arising from, each site. Historic landfill tax receipts for Scotland are therefore estimated based on the proportion of UK waste sent to landfill in Scotland.

Assumptions

Our SLfT model is underpinned by four key assumptions:

- **Total waste arisings reduce by 15% between 2011 and 2025.** This target is set out in *Safeguarding Scotland’s Resources - Blueprint for a More Resource Efficient and Circular Economy* (October 2013).

- **Total disposals to landfill fall to 5% of total waste arisings by 2025**, falling on a straight-line basis. This target is part of *Scotland's Zero Waste Plan* (June 2010), and also reflects the ban on local authorities disposing of recyclable waste to landfill from January 2016.

- **All “mixed waste” reported by SEPA is standard rated.** SEPA waste data is not categorised by the same material definitions which apply to the standard and lower rates of Landfill Tax. The share of mixed waste in total landfilled waste according to SEPA data is comparable to the UK share of standard-rated waste in total UK landfill as recorded by HMRC, which provides some assurance over the reasonableness of this approach.

- **Active waste, taxed at the much higher (standard) rate, remains a constant proportion of total waste over time** and exempt waste remains a constant proportion of inactive waste (taxed at the much lower reduced rate) over time.

These assumptions are based on the achievement of ambitious Scottish Government waste policy targets, including reductions in total waste and the proportion of waste disposed of to landfill. If these targets are not achieved then, all other things being equal, volumes of taxable waste would be greater than those reflected in current forecasts and so tax receipts would exceed the levels currently forecast. We therefore consider these assumptions to be conservative and prudent.

In combination, the first two assumptions imply that the amount of waste landfilled declines by 30% between 2011/12 and 2015/16.
Methodology
We applied these assumptions to the model to produce forecasts of gross receipts from LfT. We then compared the volume of waste disposals reported by UK environment agencies in 2011/12 with the volume of waste disposals subject to LfT as reported by HMRC. While the UK environment agencies reported total waste disposals of 52,107 thousand tonnes, HMRC reported taxed waste disposals of 43,982 thousand tonnes – 16% lower than the environment agencies’ figures. As noted above, HMRC is unable to provide disaggregated LfT receipts data for Scotland. It is therefore not possible to determine how much, if any, of the 16% differential in reported waste volumes relates to Scotland. In the interests of producing a prudent forecast, we therefore reduce the projected gross receipts by 16% to take account of potentially lower taxable volumes of waste. This data discrepancy needs to be better understood, but we consider it reasonable to assume a lower volume of taxable waste in the absence of a clear explanation. Revenue Scotland will be working with SEPA to trace differences in tax and waste data returns to check tax compliance.

The gross receipt projections need to be further adjusted to take account of tax credits due in respect of payments to the Scottish Landfill Communities Fund. The credit rate is the maximum proportion of LfT liability that an operator can offset by making payments into Landfill Communities Fund approved projects. The Draft Budget proposes that the tax credit rate for the Scottish Landfill Communities Fund will be set at 5.6%, 10% above the corresponding UK rate for the first three years of introduction. Our model thus reflects the anticipated higher credit rate which will be available under the Scottish Landfill Tax.

Forward look
The Scottish Government will keep the forecasting methodologies for the devolved taxes under review, and in particular will consider how the approach outlined in this paper can be refined in future years as outturn data for the devolved taxes becomes available and in light of recommendations made by the Scottish Fiscal Commission.