

### BOX B: DEPARTMENT OF FINANCE ONE-YEAR-AHEAD TAX FORECASTS

This box examines the Department of Finance's tax forecasting performance over the period 1997-2012. Of interest are the size and direction of forecast errors as well as the relative contributions of different tax categories to the overall error.<sup>26</sup> Forecasting errors are measured by comparing one-year-ahead tax forecasts published in the Budget for total tax revenue and for individual tax heads with outcomes from the end-year Exchequer returns.<sup>27</sup>

Summary measures of forecasting errors are shown in Table B1 and Figure B1, both for the entire period under review and for three sub-periods (corresponding roughly to the pre-crisis period, the height of the crisis and the aftermath). The mean error (ME) shown in Table B1 is calculated as the average of the yearly differences between tax outturns and the corresponding one-year-ahead Budget forecast, expressed as a percentage of the actual outturn.<sup>28</sup> This measure is a useful indicator of the average direction of the forecast errors and can be informative about possible bias in the forecasting process. The root mean square error (RMSE) measure shown in Figure B1 gives a better sense of the magnitude of the errors, as it is not differentially affected by positive and negative errors.<sup>29</sup>

For the period as a whole, the ME across tax heads was slightly negative (-1.1 percent). It is evident from Table B1, however, that this average was influenced heavily by large negative errors in 2008-2009, as the Department of Finance (and forecasting agencies generally) failed to predict the sharp economic downturn.<sup>30</sup> For 10 of the 16 years in the sample, forecast errors for overall tax revenue were positive, peaking at 8.5 percent in 2006 (Figure B2).

With the exception of the 2010-2012 period, the largest RMSEs have been consistently in capital taxes and the "other" category, with the latter including stamp duties. The major influence of property market developments on these tax categories is reflected in the large positive MEs during the boom years, as revenues from this source were underestimated, followed by even larger negative errors during the subsequent correction. Figure B2 shows that the contributions of errors in capital and "other" taxes became more significant between 2003 and 2009, when these categories had a major influence on the overall tax forecasting error, despite the small size of their contributions to the total tax take. For example, in 2005,

<sup>26</sup> We examine six tax categories. These include the four main tax heads – income tax, VAT, excise and corporation tax – which accounted for 33 percent, 29 percent, 15 percent and 14 percent of the total tax take respectively over the 1997-2012 period. The remaining two categories are capital taxes, comprising capital gains tax and capital acquisitions tax (5 percent of total) and "other", that includes stamp duties and customs duties (4 percent of total). Customs duties are forecast by the Revenue Commissioners.

<sup>27</sup> For example, for 2012, tax outturns published in the end-year Exchequer Statement for 2012 are compared with forecasts made in *Budget 2012*, published in December 2011.

<sup>28</sup> A positive error indicates that the outturn was greater than the forecast and implies that the Department of Finance underestimated the actual outturn in a particular year. Negative errors imply that the Department of Finance overestimated actual outturns.

<sup>29</sup> The RMSE is calculated as the square root of the mean of the errors squared, where the error is defined in the same way as for the ME.

<sup>30</sup> Forecasting errors during the previous economic downturn in 2001 and 2002 were also negative.

capital and “other” taxes contributed 13 percent to total tax revenue but accounted for over two-thirds of the forecasting error.

Table B1: Mean Error by Tax Head

	1997-2012	1997-2007	2008-2009	2010-2012
Income Tax	0.3	2.3	-8.6	-1.2
Excise	-2.5	-0.9	-16.0	0.4
Capital Taxes	-0.7	21.8	-128.8	2.5
VAT	-1.9	1.3	-20.7	-1.1
Corporation Tax	-3.0	2.0	-42.4	5.3
Other	0.6	7.9	-54.9	10.9
Total	-1.1	2.7	-24.7	0.6

FIGURE B1: ROOT MEAN SQUARE ERRORS BY TAX HEAD

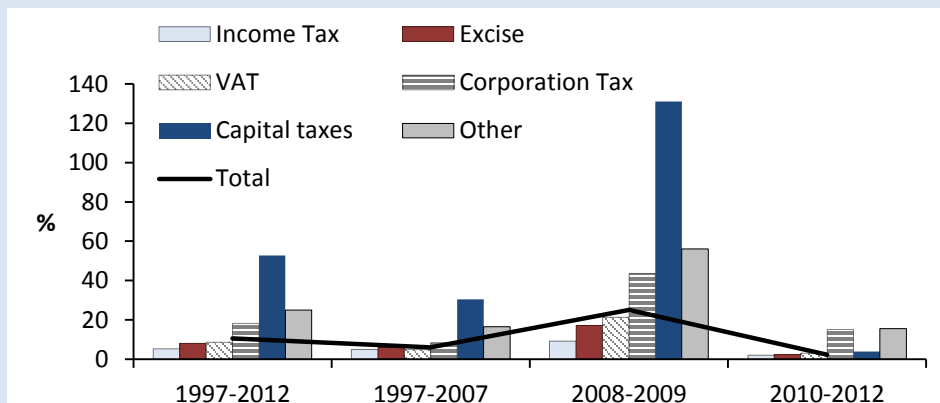
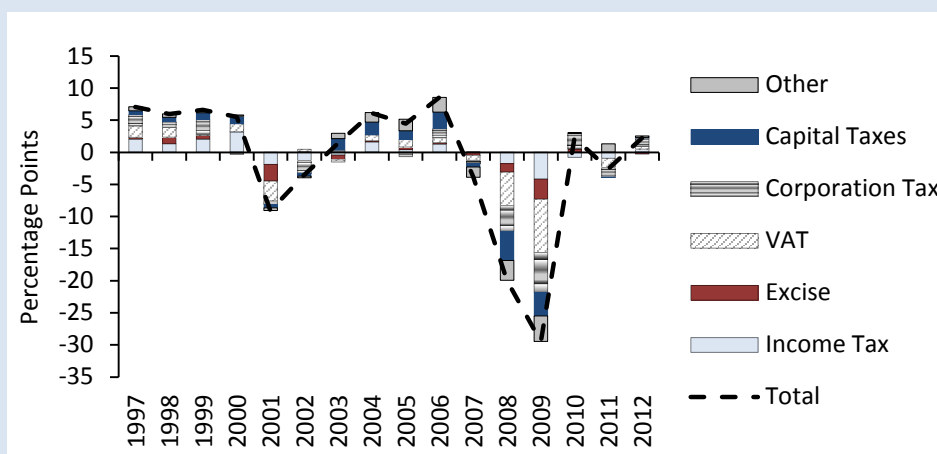


FIGURE B2: CONTRIBUTION OF EACH TAX HEAD TO THE OVERALL ERROR<sup>31</sup>



<sup>31</sup> This chart shows the proportion of the overall percentage forecasting error that can be attributed to each tax head. A negative error implies that the outcome was less than the forecast and vice versa. For example, in 2009, total tax receipts were overestimated by almost 30 percent. The overestimation of VAT and corporation tax accounted for over 8 and 6 percentage points of this error respectively.