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Revenue Forecasting Practices: Differences across Countries and Consequences for Forecasting Performance*

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Abstract

This paper reviews the practice and performance of revenue forecasting in selected OECD countries. It turns out that the cross-country differences in the performance of revenue forecasting are first of all associated with uncertainty about the macroeconomic fundamentals. To some extent, they are also driven by country characteristics such as the importance of corporate and (personal) income taxes. Also, differences in the timing of the forecasts prove important. However, controlling for these differences, we find that the independence of revenue forecasting from possible government manipulation exerts a robust, significantly positive effect on the accuracy of revenue forecasts.

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I. Introduction

When the financial crisis hit the economy of OECD countries in 2008, the fiscal outlook for most OECD countries deteriorated substantially. On the revenue side, tax receipts turned out to be much lower than officially predicted. In the US, for instance, the 2008 federal government revenues turned out to be 7.8 per cent and 5.5 per cent below official revenue forecasts by the Congressional Budget Office from January 2007 and the Office of Management and Budget from February 2007. For Ireland, the 2008 revenue figure issued by the Department of Finance in December 2008 turned out to be 13.4 per cent lower than was predicted a year earlier. It seems straightforward to relate these forecast errors to the severe recession that hardly anyone predicted in the first half of 2007 when these forecasts were made. However, given that these forecasts play an important role in setting up the budget, it seems interesting to compare forecasting performance across countries and to discuss its relationship with different forecasting practices.

Since revenue forecasting is an essential part of budgeting in the public sector, all countries make efforts to obtain reliable figures for the expected revenues – which is a difficult task. Preparing revenue forecasts involves not only predictions about macroeconomic development but also predictions about the functioning of tax law and its enforcement. Furthermore, there are changes in tax laws and structural changes in the economy that make forecasting even more difficult. Another possible uncertainty lies in the repercussions of revenue developments on public spending and the associated macroeconomic consequences. While these challenges are faced by forecasters in all countries, there are significant differences in the practice of revenue forecasting.

In particular, institutional aspects of revenue forecasting differ. In several countries, the executive branch of the government is directly in charge; other countries delegate the forecasting task to independent research institutes and emphasise the independence of forecasting. This raises the question of whether forecasting performance is affected by the different practices involved. Given the efforts that some countries devote to ensuring independence from possible government manipulation, it is particularly interesting to explore whether this independence has a noticeable impact on the quality of the forecasts.

The performance of revenue forecasting and possible determinants including institutional aspects have been explored in the literature in different directions.[1] Revenue forecasting has received most attention in the context of US states' revenue forecasts. Feenberg et al. (1989), for instance, provide evidence that state revenue forecasts are biased downwards. More

[1]For a recent survey, see Leal et al. (2008).

recently, Boylan (2008) finds evidence for biases associated with the electoral cycle. Bretschneider et al. (1989) focus on the accuracy of revenue forecasts and find that accuracy is higher in US states with competing forecasts from executive and legislative branches. Moreover, Krause, Lewis and Douglas (2006) provide some evidence that the accuracy of states' revenue fund estimates depends systematically on the staffing of the revenue forecasting teams. As Bretschneider et al. (1989) note, the design of US state governments has specific features such as balanced-budget rules and a rivalry between executive and legislative branches of government which may explain some of these results.

International comparisons have mainly centred on forecasts of the budget balance. Recently, the relative performance of deficit forecasts among European countries has been examined in the context of the European Union's Stability and Growth Pact. Strauch, Hallerberg and von Hagen (2004) consider forecast errors associated with the so-called 'stability programmes' of EU member states, Jonung and Larch (2006) discuss political biases of the output forecasts and Pina and Vedes (2007) are concerned with institutional and political determinants of forecast errors for the budget balance. With regard to the narrower issue of revenue forecasting, international comparisons of practice and performance are mainly concerned with developing countries,[2] where institutions relevant for revenue forecasting are underdeveloped.[3]

Against this background, this paper provides an analysis of the performance of official revenue forecasts and its determinants among 12 OECD countries. The selection of countries aims to capture the seven largest OECD economies (the US, Japan, Germany, Italy, the UK, France and Canada). Some further countries were added where detailed information about revenue forecasting was available – selected countries in Western Europe (Austria, Belgium, Ireland and the Netherlands) and New Zealand.

It turns out that the cross-country differences in the performance of revenue forecasting are first of all associated with uncertainty about the macroeconomic fundamentals. To some extent, they are also driven by country characteristics such as the importance of corporate and (personal) income taxes. Also, differences in the timing of the forecasts prove important. However, controlling for these differences, we find that the accuracy of revenue forecasting increases with the independence of forecasts from possible government manipulation.

Section II presents descriptive statistics on the performance of revenue forecasting among our sample of OECD countries. Section III provides an overview of the different conditions that forecasters face in these countries. Section IV discusses institutional aspects of the forecasting task among the

[2]For example, Kyobe and Danninger (2005).
[3]See Danninger (2005).

selected OECD countries and sets up a simple indicator of the independence of revenue forecasting from possible government manipulation. Section V presents empirical evidence on the determinants of forecasting performance. Section VI provides a short summary.

II. Forecasting performance

A common way to assess the quality of revenue forecasts is to consider the forecast error defined as the percentage difference between forecasted and realised revenues. A smaller forecast error is then usually regarded as a better forecast quality. However, it should be noted that official revenue forecasts are basically used to indicate the revenue constraint that needs to be taken into account in the preparation of the public budget. Often, the budget will include expenditures that have a direct or indirect effect on tax revenues. While foreseeing these effects might result in a smaller forecast error, it is not clear whether this constitutes an improvement of a forecast that basically aims to provide the policymaker with information about the revenue constraint before actions are taken. In the discussion of the revisions of US revenue forecasts, therefore, policy changes are distinguished from (macro)economic and so-called technical sources (Auerbach, 1999) of forecast errors, where the latter may refer to tax administration or evasion, for instance. However, for most countries, a decomposition is not available. Therefore the quantitative analysis presented below is based on the overall forecast error associated with the revenue forecast.

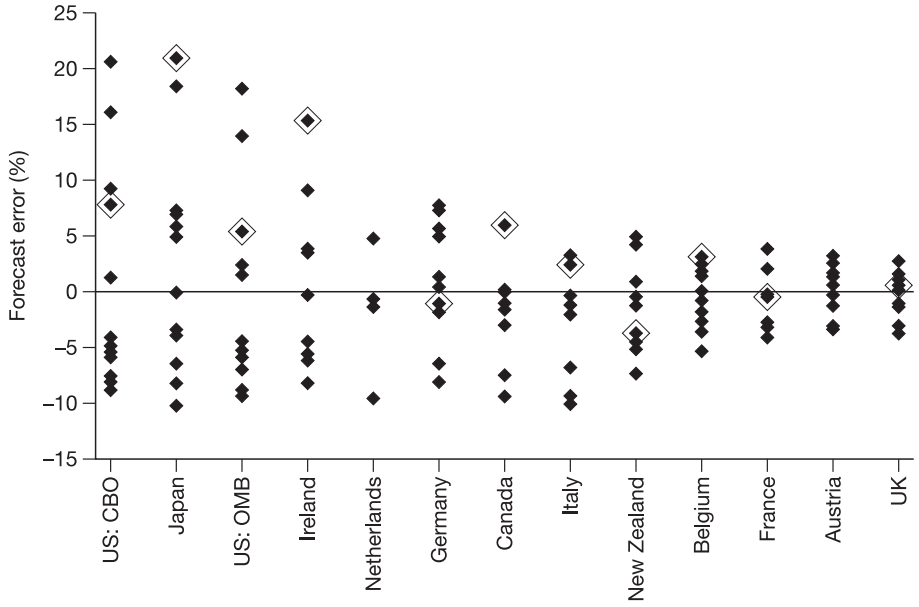
We focus on the official tax-revenue forecasts used for setting up budgets, i.e. we deal with revenue forecasts for the next fiscal year. In most cases, this implies that we consider a one-year-ahead forecast error for tax revenues. In some cases, in particular if the fiscal year differs from the calendar year, the forecast is sometimes issued in the same year as the fiscal year begins. Since, ultimately, the forecast should indicate the revenue constraint to the current budget, we define forecast errors as the deviation of the forecasts from the final revenues reported for the corresponding fiscal year.[4] With regard to the time period covered, note that we include forecasts issued from 1995 until 2009, but for several countries revenue forecasts were not available for some years and most forecasts were issued in the period from 1996 until 2007.[5] The forecast errors are depicted in Figures 1 and 2, where each point represents a single forecast error. Note that in Figure 1 the forecast errors are arranged in descending order of the respective standard deviation and that in Figure 2 they are arranged according to the year in which the forecasts were issued.

[4]Only for the most recent Canadian forecast, final revenues were not available.

[5]See Table A1 in the appendix for an overview of the actual forecasts used. In the case of the Netherlands, due to structural breaks, just five years are considered.

FIGURE 1

Forecast errors by country/institution



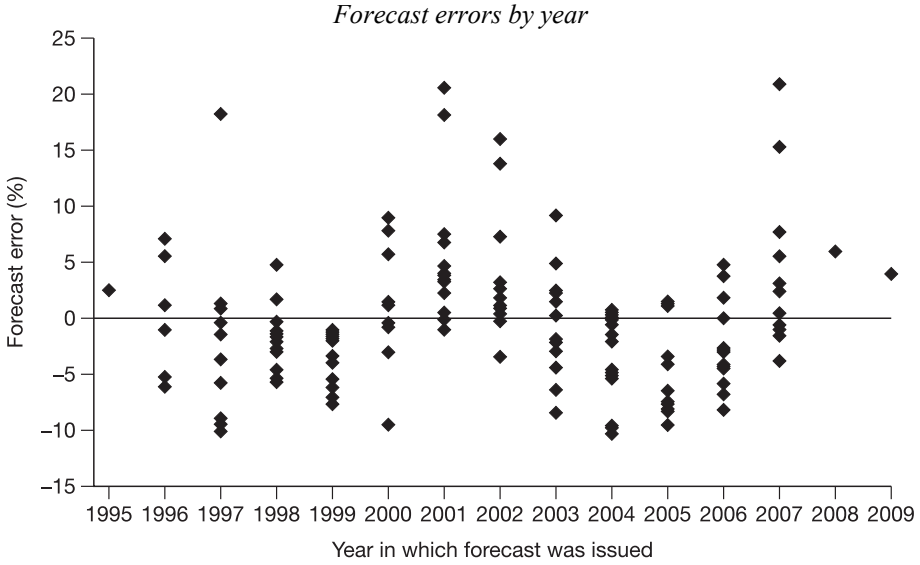
CBO – Congressional Budget Office.
OMB – Office of Management and Budget.
Notes: The figure displays the forecast errors for total tax revenues in per cent for up to 13 years in each country, each point representing one forecast. Forecast errors for 2008 are highlighted with a rhombus. A positive (negative) value denotes overestimation (underestimation). The forecasts are arranged in descending order of the standard deviation of the respective forecast errors. The two US forecasts only refer to federal taxes.

At first sight, Figure 1 seems to suggest that in most cases there is some underestimation going on. But there are also instances of large overestimations. For instance, the US Congressional Budget Office (CBO) issued a revenue forecast in January 2001 for the 2001–02 fiscal year, which started on 1 October 2001, amounting to US$2,236 billion. Two years later, revenues turned out to be only US$1,853 billion. Hence the forecast was about 20.6 per cent higher than realised revenues. A revenue forecast by the Japanese Ministry of Finance from December 2007 for the fiscal year 2008–09 turned out to overestimate actual revenues by as much as 21.0 per cent. While several other forecasts associated with 2008 (marked with a rhombus) also turned out to be overoptimistic, errors of this magnitude are rare. According to Figure 2, the forecast errors show a marked cyclical pattern.

Table 1 provides figures for the mean forecast error. A positive sign indicates an overestimation of revenues, a negative sign an underestimation. In all cases except Germany, Japan and the CBO forecast in the US, there is

FIGURE 2

Forecast errors by year



Notes: The figure displays the forecast errors for total tax revenues in per cent for 13 revenue forecasts in 12 countries. A positive (negative) value denotes overestimation (underestimation).

TABLE 1

Descriptive statistics of forecast errors

	MNFE[a]	*MNAFE*[b]	*SDFE*[c]	*RMSFE*[d]	*No. of obsns*	*Time period considered*
Austria	–0.037	1.880	2.279	2.162	10	1997 to 2006
Belgium	–0.432	2.179	2.611	2.545	13	1996 to 2008
Canada	–2.711	4.278	5.044	5.553	13	1997–98 to 2009–10
France	–1.151	2.290	2.542	2.672	10	1999 to 2008
Germany	1.308	4.458	5.419	5.351	12	1997 to 2008
Ireland	–0.536	6.271	7.608	7.274	11	1998 to 2008
Italy	–2.297	3.716	4.626	4.973	11	1998 to 2008
Japan	2.578	8.076	10.003	9.918	12	1997–98 to 2008–09
Netherlands	–3.403	5.265	6.203	6.509	5	2000 to 2002, 2005 and 2006
New Zealand	–1.535	3.465	3.939	4.058	11	1997–98 to 2007–08
UK	–0.213	1.516	1.977	1.897	11	1997–98 to 2007–08
US: CBO	0.807	8.361	10.175	9.775	12	1996–97 to 2007–08
US: OMB	–0.472	7.347	9.031	8.659	12	1996–97 to 2007–08
Average	–0.623	4.546	5.497	5.488	11	

CBO – Congressional Budget Office. OMB – Office of Management and Budget.
[a]Mean of the one-year-ahead forecast error for total revenues in per cent. A positive (negative) value denotes overestimation (underestimation).
[b]Mean absolute forecast error.
[c]Standard deviation of the forecast error.
[d]Root mean squared forecast error.

a slight underestimation of revenues. The largest difference from zero is found for the Netherlands, which shows an underestimation of 3.4 per cent on average. However, given the large standard deviations, statistically the means are not significantly different from zero.

The large differences in the standard deviation of the forecast errors (SDFE) point to substantial differences in the precision of forecasts. As can be seen in the third column of Table 1, the highest precision is achieved in the UK and Austria, while we find the lowest precision in the US and Japan.

Table 1 also reports the root mean squared forecast error (RMSFE), which is a common summary measure of forecasting accuracy, based on a quadratic loss function regarding forecast errors.[6] Note that the RMSFE is equivalent to a combination of the standard deviation of the forecast error and the mean forecast error.[7] However, as documented by Table 1, the standard deviation of the forecast error and the RMSFE of revenue forecasts do not show large differences.

III. Conditions faced by forecasters

An assessment of the considerable differences in the accuracy of forecasts needs to take account of the different conditions faced by the forecasters. First of all, this is an issue of the point in time when the forecast is made. Across countries, there are important differences in the time span between the official forecast and the beginning of the forecasted period, i.e. the beginning of the forecasted fiscal year (see the first column of Table 2). Actually, the median varies between less than 1 month and 9.5 months.

An important source of differences lies in countries' tax structures. In particular, the degree of differentiation of the tax system might matter. Rather than relying on a few large taxes, a country might employ a variety of smaller tax instruments. Provided that the different tax instruments relate to tax bases that are not closely correlated, this might reduce the revenue risks associated with the tax system. Therefore, forecasting the revenues of a large variety of small taxes might be easier than predicting the revenues in a system that relies on a small number of large taxes. To capture the differentiation of the tax structure, we use an indicator of the number of taxes based on *OECD Revenue Statistics*. More specifically, we employ the most detailed classification of taxes and, starting with the smallest taxes, count the number of taxes needed to account for 50 per cent of all tax

[6]See, for example, Clements and Hendry (2002) and Wallis (2008).

[7]The mean squared forecast error (MSFE) can be decomposed into the square of the mean of the forecast error (MNFE) and the square of the standard deviation of the forecast error (SDFE) (for example, Clements and Hendry (1998)). Formally, ignoring adjustments for the degrees of freedom, we have

$$\hat{MSFE} \approx \hat{MNFE}^2 + \hat{SDFE}^2 .$$

Taking the square root yields the root mean squared forecast error: $RMSFE \equiv \sqrt{MSFE}$.

revenues.[8] Of course, this measure is only informative if the individual taxes are really different in the above sense. Moreover, comparing the number of taxes across countries raises difficult problems of classifying taxes and the OECD classification matches the various tax systems to different extents. Nevertheless, relying on this classification, the second column of Table 2 indicates that there are large differences across countries.

Some types of taxes might be more difficult to predict than others. For instance, we might expect that there are significant differences in the forecast accuracy between forecasting corporation or personal income taxes and forecasting sales and value added taxes. This calls for a separate analysis of forecast errors according to the type of tax. The empirical analysis below therefore distinguishes four groups of taxes: personal income, corporation,

TABLE 2

Forecasting conditions

	Time span (median)[a]	*No. of taxes for 50% of revenue*[b]	GDP forecast error *MNFE*[c]	*SDFE*[d]	*RMSFE*[e]
Austria	3.5	71.1	–0.209	1.134	1.096
Belgium	2.5	53.4	0.072	1.249	1.202
Canada	1.5	34.3	0.114	1.837	1.768
France	3.5	103.3	0.185	0.910	0.883
Germany	7.5	38.3	0.284	0.987	0.987
Ireland	0.5	20.3	–0.387	2.628	2.536
Italy	5.5	48.1	0.518	1.122	1.189
Japan	3.5	36.0	0.393	1.688	1.664
Netherlands	9.5	41.1	0.252	1.605	1.458
New Zealand	1.5	19.6	–0.334	1.757	1.708
UK	0.5	41.4	–0.544	0.915	1.028
US: CBO	8.5	22.0	–0.280	1.365	1.336
US: OMB	8.0				
Average[f]	4.1	44.1	0.000	1.433	1.409

CBO – Congressional Budget Office.
OMB – Office of Management and Budget.
[a]Median time period between the forecast and the beginning of the forecasted period in months, taken from the various national sources listed in the appendix.
[b]Number of taxes needed to account for 50 per cent of revenues in the respective country, based on *OECD Revenue Statistics*.
[c]Mean of the one-year-ahead forecast error for gross domestic product in per cent. A positive (negative) value denotes overestimation (underestimation).
[d]Standard deviation of the forecast error.
[e]Root mean squared forecast error.
[f]Median time span and statistics for the GDP forecast error are weighted by number of observations.

[8]While this measure is concerned with 50 per cent of all tax revenues, note that the results are found to be robust against choosing other fractions of tax revenues.

value added and sales, and other taxes. This decomposition is also useful since the revenue forecasts are usually prepared for aggregates of individual taxes, especially if these taxes share the same source or taxpayer. This partly reflects the need to employ up-to-date information on current revenues, which is available usually on a source basis.

Another potentially important reason for differences in the forecast errors is related to uncertainty about the business cycle and macroeconomic development. This uncertainty is of particular importance not only because almost all taxes are affected by the macroeconomic environment. A typical feature of revenue forecasting is that taxes that are strongly driven by macroeconomic developments, such as corporation taxes or wage and income taxes, are forecasted using indirect methods. Predominantly, the elasticity method is employed, where some previously estimated elasticity is used to predict revenue growth based on the predicted development of GDP or its components.[9]

The last three columns of Table 2 provide some statistics for macroeconomic uncertainty for each of the different countries. Note that, as with the revenue forecasts, we are relying on the relative forecast error in percentage points. For instance, the mean forecast error of –0.544 for the UK indicates that, on average, predicted GDP was about half a percentage point lower than actual GDP.[10] Note that the GDP forecasts are not taken from the same source as the above official revenue forecasts. This is important since in some cases the macroeconomic predictions used by the forecasters are based on their own assessment, while in other cases the macroeconomic forecasts of the government are used (see Section IV). Conditioning on these predictions would not allow us to capture the impact of possible government manipulation. Therefore, we resort to the German Council of Economic Experts, an independent body which annually issues forecasts of macroeconomic developments including GDP for a large group of countries.[11]

Uncertainty about revenues also stems from changes in tax law. The immediate 'mechanical' effects of tax law changes are often difficult to estimate. In addition, changes in tax law exert all sorts of behavioural effects with revenue consequences that are hard to quantify.[12] This implies that revenue forecasts tend to be much more difficult in the presence of tax law changes. While this may suggest attempting to capture revenue effects of major tax reforms, we have not been able to collect data on revenue estimates for tax reforms. But we should note that there is also uncertainty

[9]For an overview of methods of revenue forecasting, see King (1993).

[10]As in the case of the revenue forecasts, the forecast error is computed relative to final figures.

[11]An advantage of these forecasts is that the one-year-ahead forecasts are issued every year in November, so there are no timing differences across countries and time.

[12]For a discussion of 'dynamic scoring' in revenue estimation, see Adam and Bozio (2009) and Auerbach (2005).

about which tax law changes will actually be implemented. In some countries, it is common practice not only to include in the revenue forecasts those tax law changes that are already enacted but also to include changes that are agreed within the government (Austria, the Netherlands) or noted in the budget plan (Ireland). If these changes are postponed, amended or withdrawn, large forecast errors may occur even if the revenue estimate of the reform that was initially intended was correct.

IV. Institutions and independence

A basic institutional aspect of revenue forecasting is the assignment of the forecasting task to specific institutions. Interestingly, forecasting is not always assigned to a department of the government or, more precisely, to the executive branch of the government. Only in about half of the 13 forecasts surveyed in this paper is it the Ministry of Finance (Belgium, France, Ireland, Italy, Japan) or the Treasury (New Zealand, the UK) that is responsible.[13] In most other cases, forecasting is assigned to a group representing different institutions, not only the executive branch. Some countries even assign the primary responsibility for revenue forecasting to independent research institutes (the Netherlands) and limit the influence of the executive branch such that it merely consults forecasters. In the other countries, even if the Ministry of Finance or another part of the executive is responsible, external experts from academia or forecasting agencies are often included in the forecasting group.

The efforts to involve institutions that are not part of the government or external experts are usually justified as a means to raise the independence of revenue forecasting from possible manipulation by and strategic influence of the government. Several countries explicitly produce *consensus forecasts*, where all institutions and experts involved have to agree on the forecast (for example, Austria and Germany). However, the extent to which forecasting is independent from government manipulation depends not only on the assignment of forecasting responsibility but also on whether revenue forecasting is based on government predictions for macroeconomic development, as is the case with the official German forecast.

Table 3 presents information about how revenue forecasting differs with respect to these issues. The first column indicates whether the government (= 0), research institutes (= 1) or both jointly (= 0.5) are responsible for the forecast. In some cases, no research institutes are involved but, in order to preserve a certain degree of independence, external experts are consulted (see the second column). This is the case for the US forecasts of the

[13]For a detailed list of sources for the various forecasts covered, see the appendix.

TABLE 3

Institutional characteristics and independence

	Research institutes[a]	*External/ Government experts*[b]	*Macroeconomic forecast*[c]	*Independence*[d]
Austria	0.5	0	1	0.75
Netherlands	1	–1	0	0.75
Germany	0.5	0.5	0	0.625
Belgium	0	0	1	0.25
Canada	0	0	1	0.25
New Zealand	0	1	0	0.25
US: CBO	0	1	0	0.25
US: OMB	0	1	0	0.25
UK	0	0.5	0	0.125
France	0	0	0	0
Ireland	0	0	0	0
Italy	0	0	0	0
Japan	0	0	0	0

[a]This column indicates whether the government (= 0), research institutes (= 1) or both jointly (= 0.5) are responsible for the forecast.
[b]This column indicates whether external experts (= 1) or government experts (= –1) are involved. For the UK, a value of 0.5 is entered in order to take account of the reported partial consultation of experts. In Germany, a figure of 0.5 is entered in order to account for the participation of the central bank.
[c]This column provides information about whether an external macroeconomic forecast is used. (The appendix contains a list of various national sources providing this information.)
[d]The degree of independence is obtained as a weighted sum of the first three columns. The first column is weighted by 1 and the second and third columns are weighted by 0.25 (see text).

Congressional Budget Office (CBO) and the Office of Management and Budget (OMB). In the case of the UK, a value of 0.5 is entered, in order to take account of the reported partial consultation of experts.[14] A figure of 0.5 is also entered for Germany, in order to account for the additional participation of the German central bank. For the Netherlands, a figure of –1 is entered to take account of the consulting participation of the Ministry of Finance, which may tend to reduce independence. The third column of the table provides information about the source of the macroeconomic forecast. A value of 1 indicates that an external forecast is used.

By summing across the first three columns of Table 3, we obtain a simple indicator of the independence of revenue forecasting. The first column is weighted by 1; the second and third columns are weighted by 0.25. The rationale behind this weighting is the following: a revenue forecast that is conducted by a research institute without any government experts involved would display the maximum level of independence (= 1). A government

[14]Interestingly, the UK government has recently established the Office for Budget Responsibility to 'make an independent assessment of the public finances and the economy for each Budget and Pre-Budget Report' (see http://www.hm-treasury.gov.uk/data_obr_index.htm).

forecast that includes external experts and employs an external macroeconomic forecast would obtain a medium level of independence (= 0.5). A government forecast without any external experts and without an external macroeconomic forecast would be assigned the lowest level of independence (= 0).

While the indicator varies from zero (= no independence) to unity (= full independence), in our sample of countries the highest degree of independence is 0.75. As can be seen, the indicator is highest for the Netherlands and Austria, followed by Germany. A small, but positive, level of independence can be found in Canada, New Zealand, Belgium and the UK. The US case is somewhat special since here two separate forecasts exist. One is conducted by the OMB, which assists the executive branch; the other is conducted by the CBO, which is assigned to the legislative branch. While their incentives to manipulate forecasts strategically might differ, our indicator of independence, which is simply assessing the institutional conditions, assigns a low value of independence to both of them.[15] The general composition of the index, with its emphasis on research institutes, external experts and the source of the macroeconomic forecast, reflects key institutional characteristics of revenue forecasting. Yet the weights used to aggregate the information about these institutional aspects are somewhat arbitrary. Therefore we conducted some robustness checks where the weights for external experts and external macroeconomic forecasts were increased or decreased. With regard to the ranking, however, only minor changes were found. We will come back to this issue in Section V, where we explore whether the index of independence has sufficient informational content to help explain the observed forecasting performance.

Though we include several European countries, the index does not take account of the fiscal surveillance by EU institutions. Since 1999, due to the Stability and Growth Pact (SGP), EU member states are required to submit budgetary projections including revenue forecasts every year to the European Commission and the Ecofin Council. The forecasts also play a role in the Excessive Deficit Procedure, which defines sanctions for member states that continuously violate the agreed fiscal rules. It should be noted, however, that the purpose of the corresponding revenue forecasts is different: they are not issued to set up and justify the budget plan. Rather, these projections provide the European Commission and the Ecofin Council with necessary information for the purpose of surveillance of budgetary positions and economic policies. Nevertheless, the existence of a supra-national body discussing and standardising the member states' revenue forecasts might well have implications for the national governments'

[15]Bretschneider et al. (1989) argue that the existence of two separate forecasts by the legislative and executive branches exerts a positive effect on forecasting accuracy, in particular when both forecasts are forced into a consensus. This is, however, not the case with the OMB and the CBO.

revenue forecasts. By including indicators for EU countries in the time period starting in 1999, the empirical analysis in Section V tests for a possible impact on the performance of revenue forecasts.

V. Determinants of forecasting performance

Having outlined differences in forecasting conditions and practices, let us finally turn to the question of to what extent these are associated with the large differences in forecasting performance noted in Section II. In a first step, we consider the level of the revenue forecast error and test for the presence of forecast biases. Table 4 provides the results.

Column 1 indicates that the overall mean or average forecast error is not significantly different from zero. The specification in column 2 takes account of the panel structure of the data and allows for institution-specific differences in a potential bias – which prove not significant, however. To take account of the difficulties in predicting the macroeconomic environment, columns 3 and 4 condition on the one-year-ahead GDP forecast error for each country. It shows a strongly significant impact indicating that an unpredicted increase in GDP by 1 per cent results in an increase of revenues by almost 2 per cent. According to column 3, the average conditional forecast is not significantly different from zero. When we allow the average forecast error to differ between forecasting institutions (column 4), we find that only the forecasts for Canada and Italy show significant biases. In both cases, conditional on the forecast error associated with the GDP forecast, the estimation indicates that, on average, forecasts have been too pessimistic.

In order to explore whether differences in the forecast errors can be assigned to the forecasting institutions, in columns 5 and 6 we replace the dummies with a set of institution-specific indicators, most of which are time-invariant. The set of indicators includes the time span between the forecast and the forecasted period, the indicator of the differentiation of the tax structure and the indicator of the independence of forecasting institutions. However, none of these indicators is significant. While not shown, note that we also tested for some specific effect for European countries, which are required from 1999 onwards to report revenue forecasts to European institutions. Even if we allow the coefficients for the European countries to differ in the time period from 1999 onwards, no significant differences are found.

The failure to find significant effects of institutional characteristics and country characteristics on the mean forecast error does not necessarily indicate that they do not exert any effect on revenue forecasts. Certainly, in the process of setting up the budget, a government or parliament is tempted

TABLE 4

Determinants of forecast error

Dependent variable: One-year-ahead forecast error for total tax revenues

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Constant	–0.486		–0.441		0.171	2.65
	(0.517)		(0.463)		(4.02)	(3.62)
GDP forecast error			1.89**	1.99**		1.92**
			(0.316)	(0.323)		(0.322)
Time span					0.091	0.000
					(0.167)	(0.150)
Log(No. of taxes for 50% of revenue)					–0.166	–0.879
					(1.12)	(1.01)
Independence					–0.308	0.326
					(2.29)	(2.06)
Austria		–0.037		0.380		
		(1.98)		(1.75)		
Belgium		–0.432		–0.576		
		(1.73)		(1.53)		
Canada		–2.71		–2.94*		
		(1.73)		(1.53)		
France		–1.15		–1.52		
		(1.98)		(1.75)		
Germany		1.31		0.743		
		(1.81)		(1.60)		
Ireland		–0.536		0.234		
		(1.88)		(1.67)		
Italy		–2.30		–3.33**		
		(1.88)		(1.67)		
Japan		2.58		1.80		
		(1.80)		(1.60)		
Netherlands		–3.40		–3.90		
		(2.80)		(2.47)		
New Zealand		–1.54		–0.871		
		(1.88)		(1.67)		
UK		–0.213		0.869		
		(1.88)		(1.67)		
US: CBO		0.807		1.36		
		(1.80)		(1.60)		
US: OMB		–0.472		0.84		
		(1.80)		(1.60)		
R^2	0.000	0.067	0.202	0.279	0.003	0.207
No. of observations	143	143	143	143	143	143

Notes: Standard errors are given in parentheses. * significant at 10 per cent level; ** significant at 5 per cent level.

to manipulate the revenue forecast and to underestimate or overestimate revenues. Yet a sustained manipulation in one direction, which would show up in a significant bias of the forecasts, hardly affects rational agents' beliefs and merely undermines the credibility of the official forecast.[16]

In a second step of the analysis, we explore the differences in forecasting performance using measures of forecast precision and accuracy. More precisely, we consider the standard deviation of the forecast error, which is an indicator of the precision of forecasts, and the root mean squared forecast error, which is a common summary statistic of forecast accuracy. The first two specifications in Table 5 explore whether differences in forecasting conditions show some significant effects on the precision of the forecasts, measured by the SDFE for total tax revenues. Column 1 just includes indicators of macroeconomic uncertainty and of the time span between the forecast and the beginning of the forecasted period. The results confirm a strong impact of macroeconomic uncertainty measured by the standard deviation of the GDP forecast error. They also indicate that precision decreases considerably with the time span: every additional month increases the standard deviation by three-quarters of a percentage point. In column 2, we include our indicator for the differentiation of the tax system into single taxes. The negative sign indicates that forecasting is more precise in countries where the number of taxes is larger. However, the effect is not significant.

Columns 3 and 4 show the same specifications augmented with the indicator of the independence of revenue forecasting. While the results from columns 1 and 2 are confirmed, we find that the precision of the forecast is positively associated with the independence from possible government manipulation. The coefficient of determination (R^2) for the specification in column 3 indicates that about 80 per cent of the variation in the precision of the forecasts can be associated with the time span, macroeconomic uncertainty and the degree of independence.

Since the indicator of independence rests on a weighted sum of three institutional characteristics, we conducted some robustness tests using different weights. However, the results do not indicate major differences. If the weights for external experts and external macroeconomic forecasts are increased or decreased by 0.1, for instance, all effects are confirmed (see columns 5 and 6).

[16]Consistent with this view, the literature developing models of *rational* forecast bias relies on settings not with one but with multiple forecasting agents, where individual forecasters have incentives to differentiate their forecasts from those of other forecasters (see, for example, Laster, Bennett and Geoum (1999)).

TABLE 5

Determinants of forecasting precision and accuracy: total revenues

Dependent variable:	SDFE[a]								RMSFE[b]	
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
Constant	–0.669	7.04	0.892	7.16	0.665	0.905	2.74	3.66	2.22	–0.372
	(1.78)	(7.47)	(1.67)	(6.38)	(1.56)	(1.81)	(1.68)	(6.22)	(1.53)	(5.72)
Time span	0.734**	0.635**	0.861**	0.773**	0.887**	0.830**	0.772**	0.762**	0.755**	0.785**
	(0.190)	(0.210)	(0.171)	(0.192)	(0.167)	(0.177)	(0.152)	(0.175)	(0.130)	(0.151)
Log(No. of taxes for		–1.63		–1.34				–0.216		0.584
50% of revenue)		(1.54)		(1.32)				(1.39)		(1.24)
Independence[c]			–4.40*	–4.19*	–4.88**	–3.61*	–3.89*	–3.88*	–3.44**	–3.42*
			(2.00)	(2.01)	(2.00)	(1.94)	(1.72)	(1.84)	(1.47)	(1.55)
EU-SGP							–2.15*	–2.05	–2.13**	–2.39*
							(1.03)	(1.27)	(0.873)	(1.07)
SDFE for GDP	4.36**	3.08	4.03**	3.00*	4.08**	4.02**	3.34**	3.21**		
	(1.20)	(1.69)	(1.03)	(1.44)	(0.984)	(1.09)	(0.937)	(1.32)		
RMSFE for GDP									3.66**	4.10**
									(0.878)	(1.30)
R^2	0.677	0.713	0.790	0.814	0.805	0.767	0.864	0.864	0.894	0.897
R^2 adjusted	0.612	0.617	0.720	0.721	0.741	0.689	0.796	0.767	0.841	0.824
No. of observations	13	13	13	13	13	13	13	13	13	13

[a]Dependent variable in columns 1–8 is the standard deviation of one-year-ahead forecast error for total tax revenues.

[b]Columns 9 and 10 focus on the root mean squared forecast error.

[c]Column 5 provides results from a specification where the index of independence uses a higher weight for external macroeconomic forecasts and external experts. Column 6 refers to a specification where the index uses a lower weight for external macroeconomic forecasts and external experts.

Notes: Weighted least squares estimates taking account of the number of forecasts considered in the computation of the standard deviation. Robust standard errors given in parentheses. * significant at 10 per cent level; ** significant at 5 per cent level.

To capture separate fiscal forecasting requirements according to the Stability and Growth Pact, columns 7 and 8 include an indicator for EU countries (EU-SGP). It captures the share of forecasts for European countries that were issued in the time period from 1999 onwards, when regular reports have to be filed for European institutions. Interestingly, EU-SGP shows a significantly negative effect, suggesting that the precision of revenue forecasting has generally increased in the presence of budgetary surveillance by the European Union. Yet a causal interpretation seems problematic, since the formation of the European monetary union might have exerted separate effects on the forecasting task.

Columns 9 and 10 report results of specifications where we replace the standard deviation of the forecast error with the root mean squared forecast error. While the set of explanatory variables is the same as above, for reasons of consistency macroeconomic uncertainty is also captured by the root mean squared error of the GDP forecast. It turns out that the results are very similar to the results in columns 7 and 8. Since the RMSFE combines the standard deviation and the mean of the forecast error (see footnote 7), this similarity reflects the finding in Section II that differences in the standard deviation of the forecast error are much more pronounced than differences in the means.[17]

Table 6 provides results for the precision of forecasts decomposed into four different types of taxes: (personal) income taxes, corporation taxes, value added and sales taxes, and other taxes. Thus, for each group of taxes, we compute separate indicators of forecast precision and forecast accuracy.[18] A first specification uses a similar set of variables to column 3 of Table 5. In addition, it includes dummy variables for each group of taxes. The coefficients of these variables indicate that corporation taxes show a much larger standard deviation of the forecast error. As documented by the R^2 in column 1, about 86 per cent of the differences in the precision of the forecasts can be assigned to tax structure, timing and independence. In column 2, the number of taxes needed to account for 50 per cent of revenues is included. While it is not significant, note that in the specifications reported in Table 6 this indicator refers to the corresponding group of taxes.

To test whether the time span has different effects across types of taxes, columns 3 and 4 allow for possible differences in the effect of timing among the different groups of taxes. As can be seen, the time span is relevant, particularly for corporation taxes but also for income taxes.

[17]Note also that an analysis based on the mean absolute error yields qualitatively similar results.
[18]Missing values are encountered since detailed information was not available for all countries.

TABLE 6

Determinants of forecasting precision and accuracy: disaggregated revenues

Dependent variable:	SDFE[a]						RMSFE[b]	
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Time span	0.985**	1.08**	–0.014	0.055	–0.153	0.015	–0.172	0.035
	(0.130)	(0.243)	(0.284)	(0.351)	(0.345)	(0.382)	(0.338)	(0.367)
Time span × Tax type 1			1.54**	1.45**	1.54**	1.28**	1.51**	1.21**
			(0.484)	(0.555)	(0.491)	(0.522)	(0.441)	(0.473)
Time span × Tax type 2			1.95**	1.88**	1.95**	1.75**	1.83**	1.59**
			(0.730)	(0.765)	(0.742)	(0.729)	(0.733)	(0.707)
Time span × Tax type 3			0.512	0.469	0.512	0.391	0.604*	0.462
			(0.339)	(0.360)	(0.344)	(0.360)	(0.335)	(0.336)
SDFE for GDP	3.68**	5.38**	3.68**	4.02**	3.01**	3.84**		
	(1.06)	(1.82)	(1.10)	(1.25)	(0.610)	(1.32)		
RMSFE for GDP							3.09**	4.23**
							(0.484)	(1.31)
Log(No. of taxes for 50%		2.09		0.419		1.18		1.39
of revenue)		(1.41)		(0.950)		(1.10)		(1.06)
Independence	–4.87**	–4.89*	–4.87*	–4.87*	–3.57**	–3.33*	–2.82**	–2.46*
	(2.15)	(2.60)	(2.23)	(2.32)	(1.48)	(1.58)	(1.34)	(1.34)
EU-SGP					–2.65**	–3.17**	–2.68**	–3.25**
					(0.641)	(0.958)	(0.509)	(0.812)
Tax type 1	2.45	–2.66	2.44	1.42	4.21**	1.67	4.00**	0.763
(income taxes)	(2.15)	(3.87)	(2.16)	(2.63)	(1.38)	(3.38)	(1.12)	(3.24)
Tax type 2	11.0**	6.13	11.0**	10.0**	12.7**	10.3**	12.5**	9.38**
(corporation taxes)	(2.68)	(3.43)	(2.61)	(2.50)	(2.04)	(3.19)	(1.85)	(3.11)
Tax type 3	0.782	–8.21	0.788	–1.01	2.56*	–2.18	2.50**	–3.32
(value added & sales taxes)	(2.07)	(6.59)	(2.08)	(3.99)	(1.20)	(5.13)	(0.939)	(5.04)
Tax type 4	0.868	–6.04	0.880	–0.504	2.65**	–0.911	2.41**	–2.02
(other taxes)	(2.41)	(5.50)	(2.25)	(3.30)	(1.07)	(3.98)	(0.933)	(3.94)
R^2	0.862	0.874	0.916	0.916	0.925	0.928	0.928	0.932

Notes to Table 6
[a]Dependent variable in columns 1–6 is the standard deviation of the one-year-ahead forecast error for tax revenues grouped into four types of taxes.
[b]Columns 7 and 8 focus on the root mean squared forecast error.
Notes: No. of observations = 48 for all specifications. Robust standard errors given in parentheses take account of possible correlation between the forecasts for different groups of taxes. * significant at 10 per cent level; ** significant at 5 per cent level.

All specifications support a negative significant effect on the forecast error for the independence of revenue forecasts. Columns 5 and 6 include indicators for the share of forecasts where reporting requirements to EU institutions existed (EU-SGP). Again, we find significantly negative effects, suggesting that the quality of revenue forecasts is increased as a result. The final two columns of Table 6 report results of specifications that focus on the root mean squared forecast error. As with Table 5, the results are very similar, qualitatively.

VI. Summary

In this paper, we have compared revenue forecasting practice and performance across selected OECD countries. While the mean forecast error is small in most countries, the standard deviation of the forecast error and also summary statistics of forecast accuracy, such as the root mean squared forecast error, point to substantial differences in forecasting performance across countries. This raises the question of whether differences in performance are associated with differences in the conditions and practices of revenue forecasting in these countries.

First of all, it seems likely that important conditions for revenue forecasting are different. This refers to uncertainty about the macroeconomic fundamentals as well as to country characteristics such as the tax structure both in terms of the differentiation into different taxes and with regard to the importance of corporate and (personal) income taxes. But also institutional arrangements vary between countries. This refers not only to the timing of revenue forecasts. While in some countries the Ministry of Finance or the Treasury is responsible, other countries delegate the forecasting task to research institutes. Further differences arise with regard to the inclusion of external experts and with regard to the source of macroeconomic forecasts. To summarise these differences, we came up with an index of independence from possible government manipulation. According to this index, the revenue forecasts are most independent in Austria and the Netherlands.

The quantitative analysis shows that the cross-country differences in the performance of revenue forecasting are first of all related to uncertainty about macroeconomic development: the GDP forecast error exerts a strong effect on the error of revenue forecasts; also, the precision of the revenue

forecasts, measured by the standard deviation of the forecast error, is found to be driven by macroeconomic uncertainty. Controlling also for differences in the timing of forecasts, we find that the precision of revenue forecasts increases with the independence of forecasts from possible government manipulation. About 80 per cent of the differences in forecasting precision concerning total revenues can be explained by differences in macroeconomic uncertainty, in timing and in the degree of independence. For the European countries, we find some evidence that forecasting precision has increased with the establishment of fiscal surveillance by the European institutions. But it seems difficult to interpret this finding as a causal effect, since the creation of the monetary union might also have exerted direct effects on the difficulties of the forecasting task.

The results are confirmed when distinguishing between four groups of taxes – (personal) income taxes, corporation taxes, value added and sales taxes, and a residual category. This analysis further shows that forecasting precision is particularly low for income and corporation taxes. For these taxes, we find that precision depends strongly on the time span between the forecast and the beginning of the forecasted period.

Our finding of a significant impact of institutional conditions on forecasting performance proves robust against alternative measures of forecasting accuracy. Employing the root mean squared forecast error as a summary measure of forecasting accuracy, we obtain very similar results.

While we have provided robust evidence for a beneficial effect of independence on forecast accuracy, an analysis of governments' incentives to exert an influence on forecasts and the consequences of this influence is beyond the scope of the current paper and is left for future research. However, given the weak evidence for significant biases, our analysis suggests that government influence tends to show up in temporary deviations of forecasts from the expected values.

Appendix. Sources of information

1. Austria

The official revenue forecast for Austria is documented/discussed in:

- Bundesministerium für Finanzen, 2007;
- home page of the Bundesministerium für Finanzen: https://www.bmf.gv.at;
- home page of WIFO (Österreichisches Institut für Wirtschaftsforschung): http://www.wifo.ac.at;
- Leibrecht, 2004.

2. Belgium

The revenue forecast of the federal government is documented/discussed in:

- Chambre des représentants de Belgique, *Budgets des Recettes et des Dépenses pour l'année budgétaire 1996*, *... pour l'année budgétaire 2007*, Brussels;
- Dobbelaere et al., 2003;
- Lenoir and Valenduc, 2006.

3. Canada

The spring revenue forecast of the Canadian Department of Finance is documented/discussed in:

- Mühleisen et al., 2005;
- O'Neill, 2005;
- home page of the Department of Finance Canada: http://www.fin.gc.ca.

4. France

The revenue forecast of the French government is documented/discussed in:

- home page of the Juridictions Financières: http://www.ccomptes.fr;
- home page of the Ministère du Budget, des Comptes Publics et Réforme de l'État: http://www.budget.gouv.fr;
- 'Les déterminants des ressources de l'État', available at http://www.vie-publique.fr.

5. Germany

The official, centralised forecast of the consensus forecasting group is documented/discussed in:

- Bundesministerium der Finanzen, Finanzbericht, 1997–2008;
- Bundesministerium der Finanzen, 2005;
- Gebhardt, 2001;
- home page of the Bundesministerium der Finanzen: http://www.bundesfinanzministerium.de.

6. Ireland

The revenue forecast of the Irish government is documented/discussed in:

- Budgets of the Department of Finance, available at http://www.budget.gov.ie;
- home page of the Department of Finance: http://www.finance.gov.ie;
- home page of the Office of the Revenue Commissioners: http://www.revenue.ie;
- Minutes of the Committee of Public Accounts of the Irish Parliament, 23 January 2003: http://www.irlgov.ie/committees-29/c-publicaccounts/20030123/Page1.htm;
- report of the Tax Forecasting Methodology Review Group, 2008, available at http://www.finance.gov.ie;
- report of the Tax Forecasting Methodology Group, 1999, available at http://www.finance.gov.ie.

7. Italy

The revenue forecast of the Italian government is documented/discussed in:

- Ministero dell'Economia e delle Finanze, *Documento di Programmazione Economico e Finanziaria per gli anni 1998–2000*, *... per gli anni 2006–2009*, Rome;
- Istituto Nazionale di Statistica, 2007.

8. Japan

The revenue forecast of the Japanese government is documented/discussed in:

- Adachi, 2006;
- home page of the Cabinet Office: http://www.cao.go.jp;
- home page of the Ministry of Finance: http://www.mof.go.jp.

9. Netherlands

The official revenue forecast of the Netherlands Bureau for Economic Policy Analysis (CPB) is documented/discussed in:

- Bos, 2007;
- CPB, *Forecasting Tax Revenue*, CPB Presentation, 2005;
- European Commission, 2006;
- home page of CPB (Netherlands Bureau for Economic Policy Analysis): http://www.cpb.nl;
- Ministry of Finance, 2007;
- Teulings, 2006.

10. New Zealand

The revenue forecast of the Treasury is documented/discussed in:

- home page of the Treasury: http://www.treasury.govt.nz;
- Keene and Thomson, 2007;
- New Zealand Treasury, 2002 and 2007.

11. United Kingdom

The revenue forecast of the Treasury is documented/discussed in:

- HM Treasury, 2007a and 2007b;
- home page of the Treasury: http://www.hm-treasury.gov.uk;
- Pike and Savage, 1998.

12. United States

The forecasts for federal revenues by the Congressional Budget Office and the Office of Management and Budget are documented/discussed in:

- Auerbach, 1999;
- Congressional Budget Office, 1995, 1998, 2006 and 2007;
- home page of the Congressional Budget Office: http://www.cbo.gov;
- home page of the Office of Management and Budget: http://www.whitehouse.gov/omb;
- Joint Committee on Taxation, 1992.

13. Other sources

- GDP forecast errors for all countries are based on the reports of the German Council of Economic Experts, an independent body that issues annual reports including GDP forecasts for a large group of developed countries; see http://www.sachverstaendigenrat-wirtschaft.de/en/index.php.
- *OECD Revenue Statistics*, various issues.

TABLE A1

Timing of forecasts and time span

Austria	*Forecast*	*Time span*
2006	Sep 05	3.5
2005	Sep 04	3.5
2004	May 03	7.5
2003	May 03	–4.5
2002	Sep 01	3.5
2001	Oct 00	2.5
2000	Mar 00	–2.5
1999	Sep 98	3.5
1998	Sep 97	3.5
1997	May 96	7.5
Median		3.5

France	*Forecast*	*Time span*
2008	Sep 07	3.5
2007	Sep 06	3.5
2006	Sep 05	3.5
2005	Sep 04	3.5
2004	Sep 03	3.5
2003	Sep 02	3.5
2002	Sep 01	3.5
2001	Sep 00	3.5
2000	Sep 99	3.5
1999	Sep 98	3.5
Median		3.5

Belgium	*Forecast*	*Time span*
2008	Mar 08	–2.5
2007	Nov 06	1.5
2006	Oct 05	2.5
2005	Oct 04	2.5
2004	Oct 03	2.5
2003	Oct 02	2.5
2002	Oct 01	2.5
2001	Oct 00	2.5
2000	Oct 99	2.5
1999	Oct 98	2.5
1998	Oct 97	2.5
1997	Oct 96	2.5
1996	Oct 95	2.5
Median		2.5

Canada	*Forecast*	*Time span*
2009–10	Jan 09	2.5
2008–09	Feb 08	1.5
2007–08	Mar 07	0.5
2006–07	May 06	–1.5
2005–06	Feb 05	1.5
2004–05	Mar 04	0.5
2003–04	Feb 03	1.5
2002–03	Dec 01	3.5
2001–02	Feb 00	13.5
2000–01	Feb 00	1.5
1999–2000	Feb 99	1.5
1998–99	Feb 98	1.5
1997–98	Feb 97	1.5
Median		1.5

Germany	*Forecast*	*Time span*
2008	May 07	7.5
2007	May 06	7.5
2006	May 05	7.5
2005	May 04	7.5
2004	May 03	7.5
2003	May 02	7.5
2002	May 01	7.5
2001	May 00	7.5
2000	May 99	7.5
1999	May 98	7.5
1998	May 97	7.5
1997	May 96	7.5
Median		7.5

Japan	*Forecast*	*Time span*
2008–09	Dec 07	3.5
2007–08	Dec 06	3.5
2006–07	Dec 05	3.5
2005–06	Dec 04	3.5
2004–05	Dec 03	3.5
2003–04	Dec 02	3.5
2002–03	Dec 01	3.5
2001–02	Dec 00	3.5
2000–01	Dec 99	3.5
1999–2000	Dec 98	3.5
1998–99	Dec 97	3.5
1997–98	Dec 96	3.5
Median		3.5

US: CBO	*Forecast*	*Time span*
2007–08	Jan 07	8.5
2006–07	Jan 06	8.5
2005–06	Jan 05	8.5
2004–05	Jan 04	8.5
2003–04	Jan 03	8.5
2002–03	Jan 02	8.5
2001–02	Jan 01	8.5
2000–01	Jan 00	8.5
1999–2000	Jan 99	8.5
1998–99	Jan 98	8.5
1997–98	Jan 97	8.5
1996–97	Jan 96	8.5
Median		8.5

US: OMB	*Forecast*	*Time span*
2007–08	Feb 07	8.0
2006–07	Feb 06	8.0
2005–06	Feb 05	8.0
2004–05	Feb 04	8.0
2003–04	Feb 03	8.0
2002–03	Feb 02	8.0
2001–02	Feb 01	8.0
2000–01	Feb 00	8.0
1999–2000	Feb 99	8.0
1998–99	Feb 98	8.0
1997–98	Feb 97	8.0
1996–97	Feb 96	8.0
Median		8.0

Ireland	*Forecast*	*Time span*
2008	Dec 07	0.5
2007	Dec 06	0.5
2006	Dec 05	0.5
2005	Dec 04	0.5
2004	Dec 03	0.5
2003	Dec 02	0.5
2002	Dec 01	0.5
2001	Dec 00	0.5
2000	Dec 99	0.5
1999	Dec 98	0.5
1998	Dec 97	0.5
Median		0.5

Italy	*Forecast*	*Time span*
2008	Jun 07	6.5
2007	Jul 06	5.5
2006	Jul 05	5.5
2005	Jul 04	5.5
2004	Jul 03	5.5
2003	Jul 02	5.5
2002	Jul 01	5.5
2001	Jun 00	6.5
2000	Jun 99	6.5
1999	Apr 98	8.5
1998	May 97	7.5
Median		5.5

New Zealand	*Forecast*	*Time span*
2007–08	May 07	1.5
2006–07	May 06	1.5
2005–06	May 05	1.5
2004–05	May 04	1.5
2003–04	May 03	1.5
2002–03	May 02	1.5
2001–02	May 01	1.5
2000–01	May 00	1.5
1999–2000	Apr 99	2.5
1998–99	Apr 98	2.5
1997–98	May 97	1.5
Median		1.5

UK	*Forecast*	*Time span*
2007–08	Mar 07	0.5
2006–07	Mar 06	0.5
2005–06	Mar 05	0.5
2004–05	Mar 04	0.5
2003–04	Apr 03	–0.5
2002–03	Apr 02	–0.5
2001–02	Mar 01	0.5
2000–01	Mar 00	0.5
1999–2000	Mar 99	0.5
1998–99	Mar 98	0.5
1997–98	Jul 97	–3.5
Median		0.5

Netherlands	*Forecast*	*Time span*
2006	Jun 05	6.5
2005	Mar 04	9.5
2002	Feb 01	10.5
2001	Mar 00	9.5
2000	Mar 99	9.5
Median		9.5

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