



EUROPEAN CENTRAL BANK

EUROSYSTEM

**WORKING PAPER SERIES**

**NO 843 / DECEMBER 2007**

**FISCAL FORECASTING  
LESSONS FROM THE  
LITERATURE AND  
CHALLENGES**

by Teresa Leal,  
Javier J. Pérez, Mika Tujula  
and Jean-Pierre Vidal



EUROPEAN CENTRAL BANK

EUROSYSTEM



## WORKING PAPER SERIES

NO 843 / DECEMBER 2007

# FISCAL FORECASTING LESSONS FROM THE LITERATURE AND CHALLENGES<sup>1</sup>

by Teresa Leal<sup>2</sup>,  
Javier J. Pérez<sup>3</sup>,  
Mika Tujula<sup>3</sup>  
and Jean-Pierre Vidal<sup>3</sup>



In 2007 all ECB publications feature a motif taken from the €20 banknote.

This paper can be downloaded without charge from <http://www.ecb.europa.eu> or from the Social Science Research Network electronic library at [http://ssrn.com/abstract\\_id=1054881](http://ssrn.com/abstract_id=1054881).

<sup>1</sup> The views expressed in this paper are those of the authors and do not necessarily reflect those of the European Central Bank (ECB). Thanks are due to J. Marin, L. Schuknecht and an anonymous referee of the ECB Working Papers Series for useful and constructive comments, to J. Paredes and M. Rodríguez-Vives for helping us with some data, and to H. James for editorial suggestions. Pérez acknowledges financial support from the Spanish Ministry of Science and Education under projects SEC 2003-04028/C and SEJ 2006-04803 in an early stage of the paper, when he was affiliated with the University Pablo de Olavide (Seville, Spain).

<sup>2</sup> Department of Economics and Statistics, University of Huelva, Pl de la Merced 11, 21071 Huelva, Spain;  
e-mail: [mtleal@uhu.es](mailto:mtleal@uhu.es)

<sup>3</sup> Directorate General Economics, European Central Bank, Kaiserstrasse 29, 60311 Frankfurt am Main, Germany;  
e-mail: [javier.perez@ecb.int](mailto:javier.perez@ecb.int), [mika.tujula@ecb.int](mailto:mika.tujula@ecb.int), [jean-pierre.vidal@ecb.int](mailto:jean-pierre.vidal@ecb.int)

© European Central Bank, 2007

**Address**

Kaiserstrasse 29  
60311 Frankfurt am Main, Germany

**Postal address**

Postfach 16 03 19  
60066 Frankfurt am Main, Germany

**Telephone**

+49 69 1344 0

**Website**

<http://www.ecb.europa.eu>

**Fax**

+49 69 1344 6000

**Telex**

411 144 ecb d

*All rights reserved.*

*Any reproduction, publication and reprint in the form of a different publication, whether printed or produced electronically, in whole or in part, is permitted only with the explicit written authorisation of the ECB or the author(s).*

*The views expressed in this paper do not necessarily reflect those of the European Central Bank.*

*The statement of purpose for the ECB Working Paper Series is available from the ECB website, <http://www.ecb.europa.eu/pub/scientific/wps/date/html/index.en.html>*

ISSN 1561-0810 (print)

ISSN 1725-2806 (online)

## CONTENTS

|                                                                                                                                    |    |
|------------------------------------------------------------------------------------------------------------------------------------|----|
| Abstract                                                                                                                           | 4  |
| Non-technical summary                                                                                                              | 5  |
| 1 Introduction                                                                                                                     | 6  |
| 2 Main topics in the literature                                                                                                    | 9  |
| 3 The measurement of forecasting performance:<br>is there something to be learnt from the<br>literature on fiscal forecast errors? | 11 |
| 4 Basic decisions in fiscal forecasting                                                                                            | 15 |
| 4.1 Forecasting procedures                                                                                                         | 16 |
| 4.2 Fiscal policy assumptions                                                                                                      | 20 |
| 4.3 Forecasting horizon                                                                                                            | 22 |
| 4.4 The level of disaggregation                                                                                                    | 27 |
| 5 Conclusions                                                                                                                      | 29 |
| Bibliography                                                                                                                       | 30 |
| European Central Bank Working Paper Series                                                                                         | 37 |

## **Abstract**

While fiscal forecasting and monitoring has its roots in the accountability of governments for the use of public funds in democracies, the Stability and Growth Pact has significantly increased interest in budgetary forecasts in Europe, where they play a key role in the EU multilateral budgetary surveillance. In view of the increased prominence and sensitivity of budgetary forecasts, which may lead to them being influenced by strategic and political factors, this paper discusses the main issues and challenges in the field of fiscal forecasting from a practitioner's perspective and places them in the context of the related literature.

**JEL code:** H6; E62; C53.

**Keywords:** Fiscal policies; government budget; forecasting; monitoring.

## Non-technical summary

The accountability of governments for the use of public funds in democracies is at the root of budgetary procedures and has ultimately led to the development of fiscal forecasting techniques. The Stability and Growth Pact (SGP) has increased interest in fiscal forecasting in Europe, because budgetary forecasts play a crucial role in the implementation of the European fiscal framework, with European Commission's forecasts pointing to risks to a government's fiscal target potentially triggering procedural steps in the Excessive Deficit Procedure (EDP). In view of the increased prominence and sensitivity of budgetary forecasts this paper reviews the main issues in fiscal forecasting from a practitioner's perspective, trying to identify current challenges and to draw lessons from related literature.

Two broad topics emerging from the literature on fiscal forecasting are reviewed. First, the performance of fiscal forecasters has been extensively scrutinised. Government targets have in particular been criticised for being systematically biased as a result of setting unrealistic, politically motivated targets, sometimes leading to claims that public finance projections in Europe should be produced by independent authorities to avoid politically-motivated forecast biases. While the literature on forecast performance broadly supports the view that fiscal forecasts prepared by governments tend to be biased, and inaccurate, it seems that the causes for forecast errors have been insufficiently covered in literature, and in particular their relation to the policy objectives served by fiscal forecasts and the forecasting procedures. Second, much effort has been made in order to identify best forecasting practices. However no definitive conclusions have been reached. This situation reflects the daily work of a practitioner, who must make choices on forecasting procedures, and in particular on how to make consistent macroeconomic and fiscal forecasts, on the extent to which fiscal forecasts should be based on judgement and expertise rather than on econometric or modelling techniques, and on both the appropriate horizon and the level of disaggregation of fiscal forecasts.

Overall, the main message that emerges from the review and the dilemmas faced by fiscal forecasters is that, despite the importance of having reliable quantitative predictions, good fiscal forecasts are not necessarily the best in the statistical sense, but they must allow for a thorough understanding of budgetary developments and a sound basis for fiscal policy making. With this in mind one can easily understand the rationale for the choices usually made by fiscal forecasters in terms of procedures, underlying fiscal policy assumptions, forecast horizons or levels of disaggregation. Fiscal forecasting is more an art than a science, but an art that should be to the benefit of informed fiscal policy discussions and sound fiscal policy decisions, rather than an exercise that can be assessed only on the basis of a set of forecast performance indicators.

## 1 Introduction

The accountability of governments for the use of public funds is one of the achievements of democracy, which is reflected in the elaboration and execution of public budgets. Accountability requires a clear understanding of the impact of macroeconomic developments and discretionary government action on both government revenue and expenditure. This has gradually led to the establishment of budgetary procedures and institutions and eventually the development of fiscal forecasting and monitoring techniques. Not surprisingly, therefore, fiscal forecasting and monitoring has always received attention from policy makers, monetary policy authorities, international economic organisations, financial market analysts, rating agencies, research institutions and the general public.

The Maastricht Treaty and the Stability and Growth Pact (SGP) have significantly increased interest in fiscal forecasting and monitoring in Europe, as budgetary forecasts play a crucial role in the implementation of the European fiscal framework.<sup>1</sup> Article 104 (5) of the Treaty stipulates that “*if the Commission considers that an excessive deficit in a Member State exists or may occur, the Commission shall address an opinion to the Council*”, while the budgetary forecasts of the European Commission (EC) are explicitly mentioned in the SGP as the relevant figures for assessing the temporary nature of an excessive deficit.

In the context of the European Union (EU) multilateral surveillance framework, Member States submit stability and convergence programmes to the Economic and Financial Affairs Council of the European Union (ECOFIN) and the EC once a year.<sup>2</sup> The programmes are prepared by the ministries of finance, and include fairly detailed forecasts for the key macroeconomic and budgetary variables covering the current year and at least the forthcoming three years. They also describe the main exogenous assumptions and the fiscal policy measures underlying the projections, and provide information regarding the effect of population ageing on public finances, and on the implemented and planned structural reforms.

The EC thoroughly assesses the stability and convergence programmes of Member States, referring to its own forecasts as benchmark. It tries to evaluate whether the official budgetary targets and assumptions are realistic in the light of the most recent information and the planned fiscal policy measures. More importantly, it also assesses whether the Member States risk breaching the Treaty’s 3% of GDP reference

---

<sup>1</sup> The SGP initially consisted of Council Regulation No 1466/97 of 7 July 1997 on the strengthening of the surveillance of budgetary positions and the surveillance and coordination of economic policies, Council Regulation No 1467/97 of 7 July 1997 on speeding up and clarifying the implementation of the excessive deficit procedure and the Resolution of 17 June 1997 on the SGP. On 23 March 2005 the European Council endorsed a report entitled “Improving the implementation of the Stability and Growth Pact”, which is now an integral part of the Pact. On 27 June 2005 the Pact was complemented by Council Regulation No 1055/2005 amending Regulation No 1466/97 and by Council Regulation No 1056/2005 amending Regulation No 1467/97.

<sup>2</sup> The EU Member States also submit to the Council and the EC Excessive Deficit Procedure notifications twice a year by the end of March and September in the European fiscal policy framework. They include the forecasts on nominal GDP, government net borrowing/net lending, total revenue, total expenditure and gross debt for the current year and possible revisions to the past data. Regarding the requested information see in more detail the revised code of conduct on the content and format of the stability and convergence programmes (see European Commission 2002 and 2005a for details).

value for the deficit, and/or other additional commitments. The stability and convergence programmes are then discussed in detail by the Economic and Financial Committee (EFC) and the ECOFIN Council. Finally, the Council of the EU delivers an opinion on the various programmes based on the recommendation of the EC and consultations with the EFC.

Budgetary forecasts play an important role in the European System of Central Banks (ESCB) and the European Central Bank (ECB). They provide important input to economic and inflation projections in the context of both the Eurosystem's staff's and the ECB's staff's macroeconomic projection exercises. The main purpose is to evaluate the impact of fiscal policies on economic activity and price formation, thereby contributing to monetary policy decision making. The independent budgetary forecasts also enable the ECB and the national central banks to identify possible risks underlying the official fiscal plans and to participate in discussions at national, European and international levels.

Budgetary forecasts are also part of the bi-annual macroeconomic projections of the Organisation for Economic Cooperation and Development (OECD) and the International Monetary Fund (IMF). They are reported in the IMF country reports under IMF article IV consultations and the OECD country surveys, and allow for recommendations to individual countries on structural fiscal policy. National research institutes prepare and publish budgetary forecasts with the aim of actively taking part in the domestic economic and fiscal policy discussions. Financial institutions and rating agencies producing their own independent fiscal forecasts provide insight on national economic developments and prospects and together with other factors influence portfolio allocations, rating decisions, and ultimately government bond prices.

Since national governments express their views about the outlook for fiscal policy in the form of annual targets and plans rather than projections or forecasts, the activities of revenue estimation and spending planning are key in the elaboration of annual budgets and the determination of (multi-annual) targets. In contrast, all other institutions involved in fiscal forecasting (EC, ECB, National Central Banks, OECD, IMF, national research institutes, financial institutions and rating agencies) aim to assess whether public finances are developing in line with official budgetary targets, and to provide a timely warning when they are moving away from those targets. Governments' fiscal policies come under particular scrutiny, and deviations of actual paths of key fiscal variables from those initially planned may spark a great deal of debate and criticism.<sup>3</sup>

Government targets/forecasts have often been criticised for being systematically biased, usually as a result of setting unrealistic, politically-motivated targets (Strauch *et al.*, 2004, Moulin and Wierts, 2006). Jonung and Larch (2006) claim that in some euro area countries biased forecasts (targets) by the governments have played an important role in the generation of excessive deficits in the past. Thus, they

---

<sup>3</sup> Of course, ministries of finance also monitor government revenue and expenditure developments regularly and typically come up with proposals for supplementary budgets in case deviations from governments' annual targets become evident during the year.

claim that public finance projections in Europe should be produced by independent authorities to avoid politically motivated forecast biases.<sup>4</sup>

This claim is far from being widely shared by the forecasting community. Fiscal forecasting is a complicated activity involving the need for extensive knowledge of national institutions, data, and other country-specific factors.<sup>5</sup> Most studies on forecast track records tend to signal that projections by the EC for European countries are the most accurate within international organisations publishing fiscal forecasts, due to its being an independent authority.<sup>6</sup> Nevertheless, some recent research (Bruck and Stephan 2006) has challenged EC projections for presenting a number of shortcomings, including the correlation of forecast errors with the political cycles of a number of countries. Even though the results in the latter paper could certainly be discussed, it is true that caution has to be exercised when assessing fiscal forecast performance and biases.<sup>7</sup>

As an illustration, the behaviour over time of the EC and government budget balance projections/targets is shown in Figure 1. The figure shows EC projected paths and government targets for the period 1999-2006. An apparent pattern may be observed, as both sets of projections/targets share an optimistic bias in periods of budget balance deterioration and a pessimistic bias during periods in which the budget balance improved. This common pattern cannot be detached from the poor record by the forecasting community in anticipating turning points in economic activity.

In view of the increased prominence and sensitivity of budgetary forecasts this paper reviews the main issues in fiscal forecasting from a practitioner's perspective, trying to identify current challenges and to draw lessons from the literature. After a brief review of the main topics in the literature in Section 2, Section 3 examines the measurement of fiscal forecasting performance. It discusses in Section 4 the main decisions forecasters have to take when designing their forecasting tools. These concern the forecasting procedures, the forecasting horizon, the level of disaggregation and how to deal with underlying fiscal policy assumptions. Section 5 provides conclusions. The paper contains an extensive and up-to-date section with relevant bibliographical references.

---

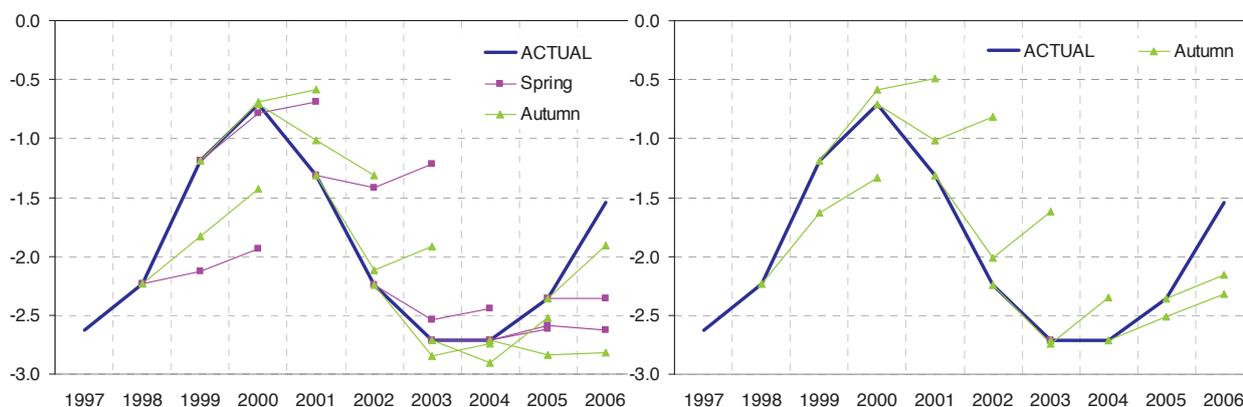
4 The topic of an independent authority in charge of fiscal (and macroeconomic) projections has recently received a great deal of attention (see for example the CEPR book by Fatas et al. 2003).

5 Along these lines, see the general discussion and comments included in the paper by Jonung and Larch (2006) (in particular pages 530 and 531). In a related fashion Giles and Hall (1998) argue for an increase in transparency on assumptions underlying budgetary projections to allow for public debate and public opinion pressure rather than the creation independent institutions.

6 As for example Artis and Marcellino (2001), Keereaman (1999) and Melander et al. (2007).

7 While claiming that they analyse the properties and determinants of government deficit forecasts by national authorities, Bruck and Stephan (2006) de facto use forecasts prepared by the EC as the basis for their analysis (p. 4). Thus, their claim that "The [Stability and Growth] Pact created incentives for governments to mislead their electorates about budget deficit forecasts, especially in the run up to elections" (p. 12) if valid, would apply to the independent projections prepared by the EC. This result, framed in the light of the available literature on the properties of EC government deficit forecast errors is surprising and debatable to say the least.

**Figure 1:** European Commission government deficit projections for the euro area (left panel) and aggregation of euro area governments' targets (right panel), by exercise (spring, autumn) and horizon (current year, one year ahead), as a percent of GDP.



*Notes:* projected changes as published at the time by the respective institutions are applied to base year budget deficits for year  $t$  as published in the first release of the EDP notification for year  $t$  (estimate published in March/April of year  $t+1$  for year  $t$ ). The projection error is defined as  $A_t - F_t$  ( $A_t$  actual value, % of GDP,  $F_t$  projected value).

*Sources:* for EC forecasts the EC Spring and Autumn issues of the publication "Public Finances in EMU", various years. Government projections are targets published in the Updated Stability and Convergence programs, in most cases published in Autumn of each year  $t$ .

## 2 Main topics in the literature

Institutional factors largely determine the objectives of budgetary forecasts. These also influence the main topics addressed in academic literature. The legal requirement for the US states to stick to a balanced budget at the end of the fiscal year has supported an abundant strand of research on fiscal forecasting in the US. In Europe, more recently, the need to monitor whether the EU Member States comply with the Maastricht Treaty's and the Stability and Growth Pact's budgetary requirements has recently sparked academic interest in fiscal forecasting.

Given the role played by both revenue and expenditure forecasts in budgeting processes,<sup>8</sup> almost all national fiscal policy agencies have implemented some kind of forecasting procedure based on either judgement, simple regression equations, time series methods, structural macro-econometric models, or, more commonly, some combination of different alternatives. The need to design a procedure flexible enough to accommodate the day-to-day requirements of fiscal policy decision-making tends to create tensions with the use of appropriate tools. This trade-off has guided practitioners and scholars in the discussion of which procedure would best fit policy requirements and formal correctness.

<sup>8</sup> An overwhelming majority of the existing papers dealing with short- and medium-term fiscal projections or attempting to assess the effect of the cycle on the budget focus on government revenues, in particular on important items such as Wage Taxes, Sales Taxes or Value Added Taxes, and Social Contributions (see Lawrence et al., 1998, and Van den Noord, 2000). However, it is not unusual to see short-term forecasting models of the spending side of the budget as, for example, in Mandy (1989) for unemployment insurance funds, or Tridimas (1992), Pike and Savage (1998), Sentance et al. (1998), and Giles and Hall (1998) for an integrated view of both revenue and spending sides. This is even more common as regards long-term projections of social spending (see for instance, Franco and Marino, 2004) which try to evaluate the impact of population ageing on fiscal sustainability.

With these tensions in mind, we detect two main themes discussed in the related literature. Firstly, some papers discuss the appropriate procedures for fiscal forecasting, in many cases by means of accuracy comparisons. Secondly, conditional on a given procedure, other papers discuss the properties of the produced forecasts, in terms of (systematic) biases and violation of the rationality hypothesis.

From a study of the available literature it is not clear which method fiscal and monetary authorities, international economic organisations, financial market analysts, rating agencies or research institutes should be adopting when preparing their forecasts. Bretschneider *et al.* (1989) compare the forecasting accuracy of different forecasting methods. On the basis of their results, they favour a combination of judgement and simple econometric equations, against time series and complex econometric models. They suggest that the main reason for this is the knowledge of special events State revenue forecasters might have. Grizzle and Klay (1994) also show evidence for combining judgement and simple methods against more complicated or automated techniques. In the same vein, Lawrence *et al.* (1998) back simple regression methods on the basis of transparency. Baguestani and McNown (1992), and Nazmi and Leuthold (1988), still ascertain time series techniques as viable for tax receipts forecasting, while Fullerton (1989) and Litterman and Supel (1983) provide some evidence to support the combining of different forecasting techniques.

Pike and Savage (1998), Sentance *et al.* (1998), Cao and Robidoux (1998), Giles and Hall (1998), and Willman *et al.* (2000) present the fiscal side of structural macroeconomic models. Macroeconomic models as iteration tools for preparing the budgetary forecasts allow for estimating the effects of fiscal policy on economic activity. Moreover, they guarantee the consistency between the macroeconomic, inflation and budget projections. However, it is often the case that such models are too aggregated to produce sufficiently detailed government revenue and expenditure projections, which are necessary for a thorough assessment of public finances.<sup>9</sup>

Some international organisations have chosen to follow an iterative process to overcome the shortcomings related to the use of large scale macroeconomic models in the context of the forecast exercises. This has been done by linking the independent macroeconomic models and sufficiently detailed satellite fiscal models together so that a high – if not full – degree of consistency is achieved in the final forecasts (see European Central Bank, 2001) while allowing at the same time for the high level of disaggregation of revenue and expenditure needed for budgetary forecasting and fiscal policy assessment.

Conditional on a given procedure, a great deal of literature has analysed the potential bias the political and institutional process might have on revenue and spending forecasts (Auerbach, 1995 and 1996, Plesko, 1988, Feenberg *et al.*, 1989, Bretschneider *et al.*, 1989, Shkurti and Winefordner, 1989, Cassidy *et al.*, 1989, Bruck and Stephan 2006, Jonung and Larch 2006), and the nature and properties of forecast

---

<sup>9</sup> For a discussion on fiscal blocks in leading macroeconomic models see Bryant and Zhang (1996a and 1996b), European Commission's QUEST model in Roeger and in't Veld (1997), IMF's MULTIMOD in Laxton *et al.* (1998), and Eurosystem models in Fagan *et al.* (2001) and Fagan and Morgan (2005).

errors within national states (Cohen and Follete, 2002, Campbell and Ghysels, 1995, Jenness and Arabackyj, 1998, Auerbach, 1999, Gentry *et al.*, 1989, Fullerton, 1989, Melliss, 1996, Melliss and Whittaker, 1998, Baguestani and McNown, 1992, Mühleisen *et al.*, 2005, Moulin and Wierds, 2006, Strauch *et al.* 2004) and international organisations (Artis and Marcellino, 1998 and 2001, Pons, 2000, Keereman, 1999, or Golosov and King, 2002). The main lessons we can draw from this strand of literature are that: (i) there is evidence of the existence of systematic political and institutional bias in revenue forecasting in the case of European countries, while the evidence for the US is mixed; (ii) forecast quality deteriorates with the length of the forecasting horizon; (iii) forecasts from independent, competing agencies tend to increase forecast accuracy (see also Giles and Hall, 1998); (iv) nevertheless information matters, as outside forecasts (from independent forecasters) tend to be less accurate than inside forecasts (from staff of the relevant organisation); (v) unforeseeable policy decisions and institutional changes have a significant impact on forecast error patterns across time.

In Section 3 and Section 4 we elaborate on the two topics identified from the related literature: (i) the performance of fiscal forecasters; and (ii) the appropriate procedures for fiscal forecasting.

### **3 The measurement of forecasting performance: is there something to be learnt from the literature on fiscal forecast errors?**

In the academic literature there is a wealth of papers evaluating forecast records, more often for the macroeconomic side of the economy than for the fiscal side. Any accuracy comparison has to be taken with caution. Firstly, the information set available when generating real-time forecasts tends to be much smaller than that available when performing ex post comparisons. For example, GDP revisions, lags in the availability of fiscal data, or frequent revisions, and, most importantly, changes in announced policy actions or the appearance of non-announced policy measures, makes necessary a careful check of the information available when preparing forecasts, so that the evaluation is fair and informative. Secondly, evaluating point forecasts of certain variables (such as Net Lending/Borrowing of the General Government) does not permit a comprehensive assessment of a set of projections where all economic and fiscal variables are jointly determined.

Evaluating forecast accuracy might still be a crucial element of forecasting procedures. It is relevant for monitoring purposes, and allows for improving forecasts by learning from past errors. Sizeable, systematic or biased forecast errors in certain items would presumably allow fiscal analysts to identify weaknesses in their forecasting procedures, in terms of methods, discussions or decision-making processes.

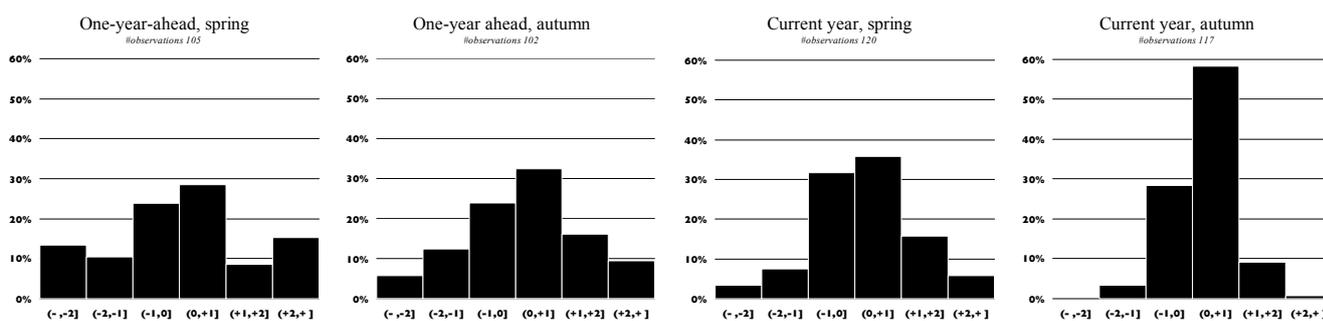
What can one learn from the literature analysing fiscal forecast errors by international organisations and governmental bodies? From a theoretical point of view (see, for example, Musso and Phillips, 2002, or Auerbach, 1999) a series of forecast errors should be analysed on three fronts: unbiasedness, efficiency



and accuracy. Obviously, in addition to the historical examination of forecasting performance, a real-time forecaster would need to understand the causes for short-run errors.

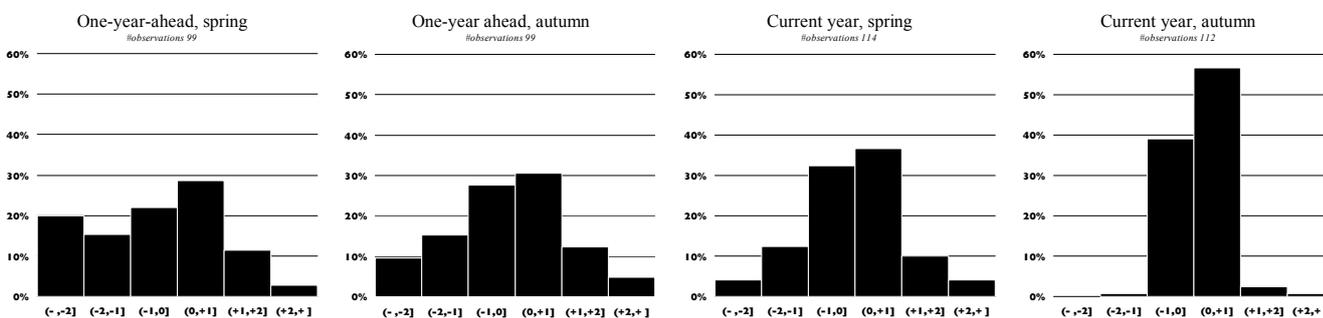
As an appetizer, Figure 2 shows the distribution of government budget balance forecast errors – taken from the EC spring and autumn projections – for the pool made of 15 European countries.<sup>10</sup> The figure presents the statistical distribution of projections errors and its evolution by vintage, which is a presentation not found in other studies. The distribution of projection errors appears to be slightly twisted to under-prediction of budget balances, which might be evidence for the presence of *bias* in the pool. This seems to be particularly true for current year autumn projections. In addition, there seems to be some evidence for increased *accuracy* across consecutive vintages. Real GDP growth projection errors (Figure 3), which are tilted to the downside in autumn current year forecasts, may explain the under-prediction of current year budget balances in autumn.

**Figure 2:** Distribution of budget balance projection errors, % of GDP. Pool sample, EC projections, 1999-2006.



*Sources:* authors' calculations on the basis of data taken from the EC Spring and Autumn issues of the publication "Public Finances in EMU", various years. The projection error is defined as  $A_t - F_t$  ( $A_t$  actual value, %GDP,  $F_t$  projected value).

**Figure 3:** Distribution of real GDP growth errors. Pool sample, EC projections, 1999-2006.



*Sources:* authors' calculations on the basis of data taken from the EC Spring and Autumn issues of the publication "Public Finances in EMU", various years. The projection error is defined as  $A_t - F_t$  ( $A_t$  actual value, percentage growth,  $F_t$  projected value).

<sup>10</sup> The pool includes the Member States (EU15) prior to the 2004 EU enlargement (Belgium, Germany, Greece, Ireland, Spain, France, Italy, Luxembourg, Netherlands, Austria, Portugal, Finland, Denmark, Sweden, and the United Kingdom).

## ***Bias***

As Auerbach (1999) argues, if the costs of forecast errors were symmetric (i.e. if positive errors were as bad as negative errors), the forecasts should present no systematic bias (i.e. on average the forecast error should not differ significantly from zero). There are, however, reasons to presume that the loss functions of governments may not be symmetric. For instance, a government would tend to overestimate a deficit when the loss of an underestimation is greater (for example for a conservative, stability-oriented government, Bretschneider *et al.*, 1989). Public authorities may have an interest in presenting a pessimistic forecast to build in a safety margin that would allow them to meet budgetary targets, also in case of revenue or expenditure slippages (Keereman, 1999, Jonung and Larch 2006). The literature in question finds mixed evidence for political economy-based explanations of this sort.<sup>11</sup>

A second source of bias arises from systematically omitting relevant economic variables, or from errors in fiscal variables induced by systematic errors in economic variables (output gap, price variables, GDP volatility) through estimated tax/spending elasticities. This source of errors is supported by the results in Feenberg *et al.* (1989), Cassidy *et al.* (1989), Keereman (1999), Melander *et al.* (2007), Artis and Marcellino (2001), or Strauch *et al.* (2004).

A series of papers tests for the presence of bias in fiscal forecast errors by adopting a purely statistical approach, and considering symmetric loss functions on the part of the agencies generating the forecasts. Following Gentry (1989), unbiasedness can be formally tested by regressing the outcome on the forecast  $R_t = \alpha + \beta F_t + u_t$ , where  $R_t$  is the budgetary outcome,  $\alpha$  is a constant,  $F_t$  is the forecast and  $u_t$  is an error term, through the null hypothesis that  $\alpha$  is zero and  $\beta$  is one. Under the null hypothesis of unbiasedness the error term is the forecast error and should then be free of serial correlation (Artis and Marcellino, 2001). Holden and Peel (1990) show the test above provides a sufficient but not a necessary condition for unbiased forecasts unless the constraint  $\beta=1$  is imposed. Along these lines, Gentry (1989), Campbell and Ghysels (1995), Artis and Marcellino (1998, 2001), Keereman (1999), Melander *et al.* (2007), Pons (2000), Strauch *et al.* (2004), and Bruck and Stephan (2006) detect the presence of biases in the track record of fiscal forecasts of various governmental and international agencies, in particular as regards projections for European countries.

## ***Efficiency***

The key for an assessment on “efficiency” or “rationality” lies, firstly, in the available information at the time the forecast was elaborated (data, policy measures), and secondly in the (optimal?) use of this information (methods, procedures). The literature on fiscal forecasts tends to detect lack of rationality. Leaving aside the already-mentioned studies of bias, this conclusion has been reached through investigating: (i) the presence of serial correlation in a time series of errors (as in Campbell and Ghysels

---

<sup>11</sup> See, for example, Bretschneider *et al.* (1989), Rodgers and Joyce (1996), or Strauch *et al.* (2004), for supporting studies, and Cassidy *et al.* (1989), and Mocan and Azad (1995), for papers that find no significant evidence.

1995, Keereman 1999, Melander *et al.* (2007), Artis and Marcellino 1998 and 2001, or Gentry 1989); (ii) the correlation of the forecast errors with information available at the time the forecast was performed (as in Feenberg *et al.* 1989, Cassidy *et al.* 1989, or Strauch *et al.* 2004). Nevertheless, from the existing studies it is not possible to decouple the contribution of the information set from the violations of rationality.

### ***Accuracy***

By accuracy, following Musso and Phillips (2002), we refer to two aspects of the forecast as compared to the actual outcome. The first one is how close both are in quantitative terms, while the second one refers to the capacity of the forecast to predict the direction of change in the final outcome. Directional accuracy tends to be less considered in the analysis of fiscal forecasts than quantitative measures (exceptions are Keereman 1999, Melander *et al.* (2007), Feenberg *et al.* 1989 or Pérez 2007).

The accuracy of a set of forecasts can be considered in isolation by means of standard measures such as the Mean Error, the Mean Absolute Error or the Root Mean Squared Error (RMSE), or with sign tests. This is an interesting option when evaluating the record of a given institution (as in Keereman 1999 and Melander *et al.* 2007 for the EC). Nevertheless, in most cases the objective is the comparison of the record of several institutions regarding a given set of variables, or the comparison of a set of forecasting methods (Baguestani and McNown 1992, Grizzle and Klay 1994, Artis and Marcellino 2001, or Pérez 2007). In this case, the RMSE ratio statistic, the directional test in Pesaran and Timmerman (1992), and non parametric tests to check the null hypothesis of no difference in the accuracy of two competing forecasts as the one by Diebold and Mariano (1995) are widely used.<sup>12</sup>

### ***Causes of forecast errors***

In addition to the historical examination of forecasting performance – along the three selected fronts of unbiasedness, efficiency and accuracy – a real-time forecaster would need to understand the causes of the errors. Auerbach (1995) distinguishes between three types of errors: policy errors, economic errors and technical (behavioural) errors. Policy errors are due to errors on the course of fiscal policy, owing to the implementation of new, not yet announced by the forecast cut-off date, fiscal policy measures or cancellation of the previously announced measures. Economic errors are those that can be explained by wrong forecasts of macroeconomic variables that are used in the budget projections (GDP, interest rates, inflation). Finally, technical errors would be due to other factors. They might in part stem from behavioural responses, as signalled by Auerbach, but also from model mis-specification on the fiscal side.

---

<sup>12</sup> Other alternative tests in the vein of West and McCracken (1998) and subsequent, related works have not been used to evaluate competing fiscal forecasts.

Factors like the impact of macroeconomic forecast errors (as illustrated in figures 2 and 3), data revisions,<sup>13</sup> the occurrence of unexpected revenue collection (the so-called *revenue windfalls*) or the inappropriate ex ante impact of tax policy measures, have not been sufficiently covered in the related literature.<sup>14</sup>

All these factors, and others, are in a sense intertwined with the forecasting procedures and models developed by a given institution, the treatment of tax assumptions and other exogenous variables, the forecast horizon, the nature and amount of data used (annual, quarterly or monthly), and the level of detail (aggregation) a forecaster might want to pursue. These topics are covered in the next section.

#### 4 Basic decisions in fiscal forecasting

In order to frame the discussion, one can say that either explicitly or implicitly (in the form of a set of heuristic rules of thumb), fiscal experts have in mind the following (linearised) recursive model when building up their projections in a given year  $t$  at horizon  $j$ :

$$E_t[F_{t+j}] = f_1(L) E_t[M_{t+j}] + F_{t+j}^* \quad (1)$$

$$E_t[M_{t+j}] = m_1(L) M_t + m_2(L) F_t \quad (2)$$

$L$  stands for the lag operator. The set of relations given by (1) consists of two parts. The first part links the evolution of a certain number of fiscal variables in period  $t+j$  ( $E_t[F_{t+j}]$ , the projected values for those variables) with the expected evolution of their respective tax/spending bases<sup>15</sup> ( $E_t[M_{t+j}]$ ) via a set of coefficients given by  $f_1$ . These coefficients are usually referred to as budgetary elasticities. Elasticity-based forecasts are one of the cornerstones of fiscal projections. Budgetary elasticities are normally estimated with econometric regressions (Bouthevillain *et al.*, 2001, van den Noord, 2000), derived from tax or expenditure laws and from detailed information on the distribution of income and revenue (Mendoza *et al.*, 1994), or by simulating macro econometric models (Al-Eyd and Barrel, 2005). The second part of (1) captures, via  $F_{t+j}^*$ , the other key ingredient of a fiscal forecast: the potential impact anticipated or expected (announced or not) policy measures or special factors might have on the different government revenue and expenditure items ( $F_{t+j}$ ). This part heavily incorporates the judgement or expertise of the analyst to quantify the effects of discretionary policy measures detailed for example in budget laws or special factors on public finances.

The set of equations given in (2) tells us how tax/spending bases are expected to evolve through time. From a dynamic perspective, it is clear that the situation of tax/spending bases in the future,  $E_t[M_{t+j}]$ , will

13 On the statistical requirements for budgetary surveillance in Europe, see Bier *et al.* (2004). On revision patterns of European fiscal data see Gordo and Nogueira-Martins (2007) and Balassone *et al.* (2007).

14 Eschenbach and Schuknecht (2004), and Morris and Schuknecht (2007) point to the impact of asset price changes in fiscal revenues and expenditures as a source of government deficit and debt biases.

15 The relevant timing of the tax/spending base (either the previous or the current period) depends on: (i) the specific definition of the relevant fiscal item, given by law, including lags in tax collection; (ii) the frequency of the observations, i.e., whether the analysis is done at the annual level, or at an infra annual level.

be related to the recent fiscal developments (summarised by the term  $m_2 F_t$ ), and its own past evolution (the term  $m_1 M_t$ ). Thus, there is a feedback from fiscal variables to macroeconomic variables.<sup>16</sup>

With this framework in mind, the basic decisions a forecaster has to make when preparing fiscal projections can be divided into four groups. The first one deals with the selection of the forecasting procedure. In this regard, the analyst has to weight the role she assigns to the use of analytical/econometric tools (to estimate the elasticities,  $f_t$ , and to capture the feedback effects signalled by (2) in some way) and to judgement (through  $F^*$ ) when deriving forecast values for fiscal variables ( $E_t[F_t]$ ). The second related issue has to do with the determination of the values of  $F^*$ , i.e. the underlying fiscal policy assumptions (covering both the impacts of policy measures and special factors). The third issue would deal with the determination of the projection horizon (what is a reasonable value for  $j$ ?). The fourth issue would be the degree of detail in the forecasts: which is a reasonable disaggregation of  $F_t$  if the final aim is forecasting the net lending/borrowing of the general government sector?

All the four points are intertwined. On the one hand, the selected time horizon covered by the forecasts and the degree of detail of the projections somehow determine the selection of the forecasting procedure and the underlying fiscal policy assumptions. On the other hand, the four points also depend on the scope of the analysis. We elaborate on these issues in the following four subsections.

#### 4.1 Forecasting procedures

The lack of consensus in published papers and reports regarding the best forecasting practices reflects the daily work of practitioners. The selection of a certain forecasting procedure, reflecting a given mix between model-based assessment and judgement depends crucially on the objectives of the organisation preparing the projections. Table 1 briefly highlights the most commonly used forecasting techniques in some leading international and national institutions and organisations. For a cross-country comparison of some aspects of the budgetary forecast procedure see Mühleisen *et al.* (2005).

The forecasting framework described by (1)-(2) can be easily implemented with medium and large scale models with detailed enough macro and fiscal sides (see, for example, Pike and Savage, 1998), or with simpler models (see, for example, Favero and Marcellino, 2005). Based on such models one can evaluate the effects of budgetary policies on economic activity and prices. Macroeconomic models also ensure that the forecasts are internally consistent, since the endogenous fiscal variables are determined simultaneously with the other endogenous variables. Moreover, such models can be employed for policy simulations.

---

<sup>16</sup> The effects of technical assumptions and other factors affecting the future evolution of tax/spending bases and underlying generally macroeconomic projections are excluded from the analysis in this context.

**Table 1:** Forecasting practices in some economic institutions

|                                         | Detailed fiscal forecast (fiscal model) | Use of judgement | Macro models with detailed fiscal part | Bottom-up approach | Source                                         |
|-----------------------------------------|-----------------------------------------|------------------|----------------------------------------|--------------------|------------------------------------------------|
| <b>HM Treasury (UK)</b>                 | Yes                                     | Yes              | Integrated fiscal block                | Yes                | Pike and Savage (1998)                         |
| <b>Congressional Budget Office (US)</b> | Yes                                     | Yes              | Iterative process                      | Yes                | CBO (1998)<br>CBO (1997)                       |
| <b>Australian Treasury</b>              | Yes                                     | Yes              | Iterative process                      | Yes                | Australian Treasury (2001)                     |
| <b>Ministry of Finance, New Zealand</b> | Yes                                     | Yes              | Iterative process                      | Yes                | Szeto <i>et al.</i> (2003)                     |
| <b>Deutsche Bundesbank</b>              | Yes                                     | Yes              | Consistency checks                     | Yes                | Wendorff (2002)                                |
| <b>Bank of Canada</b>                   | No                                      | Yes              | Integrated Fiscal block                | Yes                | Coletti & Murchison (2002)                     |
| <b>European Commission</b>              | Yes                                     | Yes              | Integrated fiscal block                | Yes                | Roeger & in't Veld (1997, 2002)                |
| <b>European Central Bank</b>            | Yes                                     | Yes              | Iterative process<br>Satellite block   | Yes                | Fagan <i>et al.</i> (2001),<br>ECB (2001)      |
| <b>IMF</b>                              | No                                      | Yes              | Integrated fiscal block                | Yes                | Boughton (1997)<br>Laxton <i>et al.</i> (1998) |
| <b>OECD</b>                             | Yes                                     | Yes              | Integrated Fiscal block                | Yes                | Richardson (1987)<br>Girouard and André (2005) |

*Source:* prepared by the authors.

The fiscal sides of macroeconomic models are generally not sufficiently developed and detailed for a comprehensive analysis of fiscal developments and policies. They may therefore be better suited to macroeconomic modellers' needs than for those of fiscal analysts. In this respect, the use of macroeconomic models may lose importance in the preparation of budgetary forecasts, since fiscal experts are typically interested in producing detailed projections for individual government revenue and expenditure items. Such models are also mainly based on quarterly national accounts data, while government finances rely mostly on annual data in line with budget-setting procedures. This makes the production of fiscal projections complicated and time consuming, as the monthly and quarterly fiscal data are heavily influenced by special factors. Sufficiently detailed information on taxation is also difficult to include in the models, since national tax systems are often fairly complex. It would be necessary to incorporate disaggregated income data and a number of tax parameters in the models to shape properly the revenue side. This would in turn make the maintaining and updating of the model database a difficult task.<sup>17</sup>

<sup>17</sup> The release of the new quarterly sectoral accounts and the quarterly government finance statistics for the euro area might facilitate the production of fiscal projections with macroeconomic models in the future, once longer time series become available.

The explicit incorporation of macroeconomic projections within the fiscal forecasting procedures remains warranted. This is primarily because the cyclical position of the economy crucially affects tax collection and expenditure developments. Indeed, receipts are very sensitive to cyclical fluctuations, but so are also some spending items (mainly through changes in prices and unemployment). This is the main reason why an important part of the relevant literature studies the topic, not only for policy analysis purposes, but also for forecasting short- and medium-term fiscal developments.<sup>18</sup> Considering the projections of key macroeconomic variables as exogenous in the fiscal forecasting procedure is a widely accepted solution, as it incorporates at least the impact on  $E_t[F_{t+j}]$  of current and future macroeconomic developments. Nevertheless, this solution leaves aside all feedback effects from budgetary variables to macroeconomic and price variables.

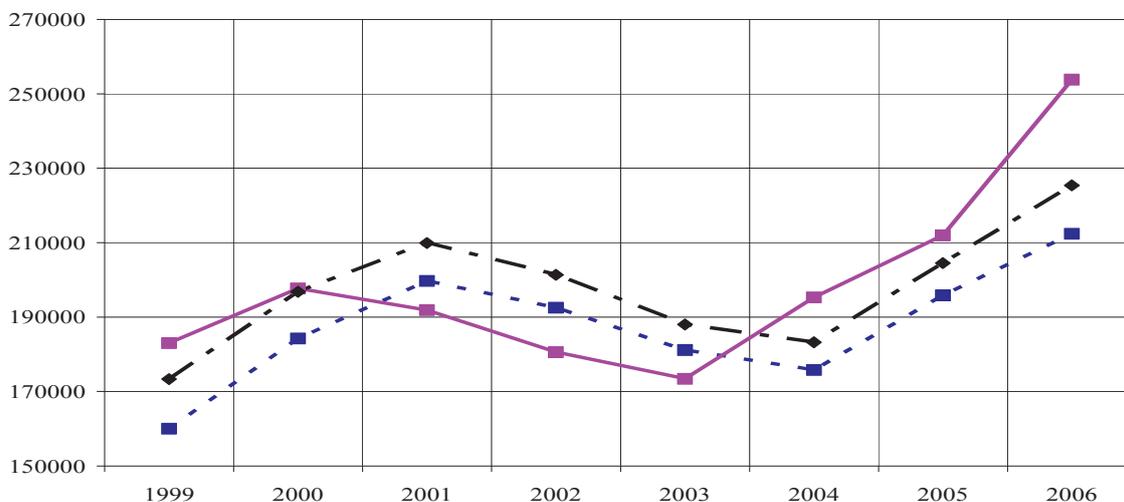
Assessing which macroeconomic developments are of a transitory nature and which are of a permanent nature (i.e. what is due to trend / cyclical developments) is of crucial importance for revenue estimation. For example, fiscal developments in the US and Europe have been systematically more favourable than initially expected over the past few years (Swiston *et al.*, 2007, Morris and Schuknecht, 2007, European Commission, 2007). Currently, a key question for policymakers, who need reliable revenue forecasts in order to formulate sensible spending plans (which once formulated tend to stay permanent), is whether and for how long this trend is likely to continue. The systematic under-prediction of certain tax revenues, in particular corporate taxes, poses many questions on how well tax bases are captured in standard fiscal models. To illustrate this point, Figure 4 shows the evolution of euro area corporate tax collection over the period 1999-2006, together with the estimation that would be derived from a standard model applying a fixed elasticity to standard tax bases (gross operating surplus of the economy and nominal GDP).

An intermediate solution between two extreme solutions of, on the one hand, considering the standard approach in which projections of macroeconomic variables are exogenous in the fiscal forecasting process and, on the other hand, considering a fully endogenous fiscal sector is to follow an iterative approach (like the one followed by Eurosystem staff, see ECB 2001), where the budgetary forecasts are produced with the help of separate fiscal satellite models. Figure 5 describes shortly the consecutive steps followed at the ECB in the context of the forecast exercises. First, the future values of the key fiscal variables are determined on the basis of the expected macroeconomic and price developments, budgetary elasticities, exogenous technical assumptions, and discretionary fiscal policy measures. Second, the main fiscal ratios and aggregates are generated with accounting identities. Finally, the fiscal variables serve as exogenous input into the macroeconomic and inflation forecasts. The overall consistency of the projections is reached by means of a converging iterative process.

---

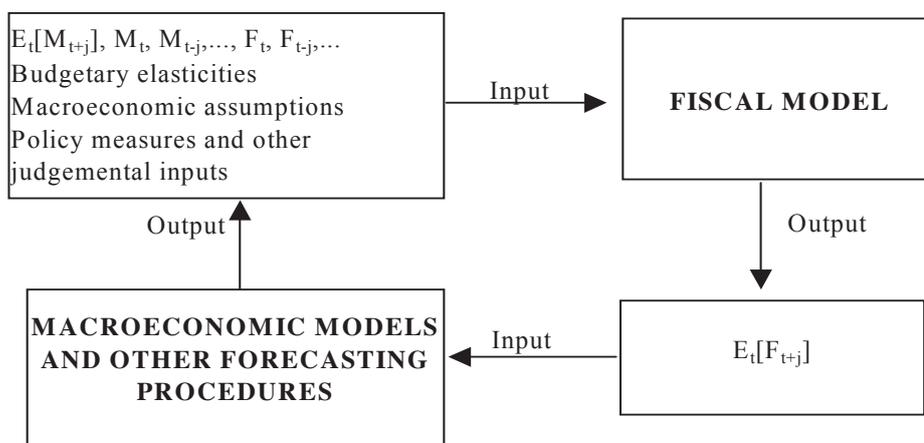
<sup>18</sup> See, as relevant examples, Holloway (1989), Sentance *et al.* (1998), Dalsgaard and De Serres (2001), Van den Noord (2000), Bouthevillain *et al.* (2001), Artis and Buti (2000), and Girouard and André (2005).

**Figure 4:** Corporate tax revenue link to macroeconomic tax bases: euro area corporate tax collection (solid line) and estimated corporate tax collection applying a fixed elasticity (1.43, OECD) to total economy gross operating surplus (dashed line) and nominal GDP (dash-dotted line)



Source: authors' calculations based on Eurostat data.

**Figure 5:** Iterative process to guarantee consistency between the fiscal and macro parts in a typical forecasting exercise



Source: prepared by the authors.

An issue that has received a great deal of attention recently is that of the instability of budgetary elasticities (European Commission, 2007, Chapter 2), the  $f_1(L)$  coefficients linking fiscal to macroeconomic developments. As highlighted by Creedy and Gemmell (2005) the literature on the built-in flexibility of taxation normally treats income changes as exogenous. On the basis of this assumption standard fiscal models either estimate or impose tax revenue elasticities. These capture the relationships between tax receipts and a measure of the tax base, such as income, for given tax rates, normally set to average values for all years. Given that tax elasticities are subject to sizeable fluctuations in the short-run, mainly because of changes in aggregate demand composition (for example, shifts in demand from net

exports to private consumption or from low to more heavily taxed consumption goods), and shifts in the distribution of income across households that are subject to different marginal tax rates, the standard assumptions of exogenous and fixed elasticities might be the source of substantial errors in revenue estimation in the short-run. Further research along the lines of implementing time-varying elasticities in standard fiscal models is thus warranted.<sup>19</sup>

Judgement is also an important ingredient in fiscal forecasting. Fiscal forecasts are achieved in many institutions and organisations through a process by which judgemental decisions are also needed as input (see Figure 5). They can enter into the projections in the form of exogenous policy variables and special expertise-based assessments. The latter includes for example knowledge on national institutional setting in different countries, infra-annual data such as monthly cash data and estimates of the effect of implemented or planned permanent fiscal policy measures, temporary measures or special factors on government budget in a specific time period. The judgement can also be based on economic theory when econometric side-tools serve as input to complement standardized macroeconomic model simulation results (see Cohen and Follette, 2002). In most cases the final projections are a combination of both model-based results and judgement.

#### 4.2 Fiscal policy assumptions

The main sources of publicly available information on fiscal policy measures (assumptions) in Europe are described in Table 2. A conservative forecaster would in general consider that the short- and medium-term budgetary projections should be based on prudent and realistic assumptions. The projections should then incorporate only those revenue and expenditure measures that have been approved by the national parliament or that have already been defined in detail by the government and are likely to pass the legislative process (see for example ECB 2001).

**Table 2:** Main sources of fiscal information on discretionary policy measures in Europe

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>▪ Budget laws and guidelines (the ministries of finance);</li><li>▪ Updated stability and convergence programmes (the ministries of finance and the European Commission);</li><li>▪ The development of government revenue and expenditure during the current year (the ministries of finance, state treasuries and national central banks);</li><li>▪ Supplementary budgets to correct budget plans within the current year (the ministries of finance);</li><li>▪ The already implemented or fully defined tax and spending reforms for the coming years (the ministries of finance).</li></ul> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Source: prepared by the authors.

---

<sup>19</sup> The interested reader can also consult Wolswijk (2007) that discusses the concept of short- and long-run budgetary elasticities.

Nevertheless, very often policy measures are not well-specified in the relevant governmental documents. If these measures are to be included in the projections it can only be done by exerting a high degree of judgement and guess-work, with the accompanying additional degree of uncertainty incorporated into the forecasts and the likely subsequent revisions once policy measures are made available with sufficient detail in the implementation stage of the budgetary process.

It is worth noting that even in the case of well-specified fiscal policy measures, the estimation of the impact of a measure is just an ex ante estimate. For example, the reduction of the Spanish income tax rate in 2007 (announced in 2006) was initially estimated by the government to amount to about 0.2% – 0.3% of GDP loss of revenue. In order to fully evaluate the impact of the tax reduction one would have to account for the behavioural responses of taxpayers, for example the existence of Laffer curve type effects) or the induced changes in the distribution of income across households. Ex ante estimates of a tax policy measure are surrounded by a significant degree of uncertainty. The degree of uncertainty of ex ante estimates is difficult to assess, because ex post it is not easy to disentangle the contribution of the policy measure to tax collection from that of the other factors, including developments in the tax base and shifts inside the tax base. Another example is the increase in the VAT rate in Germany in January 2007: it was announced in 2005, and was estimated to add some 1% of GDP to revenue in 2007 (see EC, 2006), but from the current perspective the impact does not seem to be so strong.<sup>20</sup>

A special case of fiscal policy measures are measures of temporary nature and other special factors affecting the budget.<sup>21</sup> Their reporting and quantification is extremely important in the context of the forecast reports. This is because such measures and factors may blur the picture concerning the current fiscal situation and trends (see Koen and van den Noord 2005, for a review of one-off measures and creative accounting in Europe). Their identification is essential to ensure a reliable assessment of budgetary positions.

Temporary measures can either affect the deficit and/or the debt. They can be defined as policy decisions that increase or decrease government revenue and/or expenditure only for a limited period of time or simply modify the time pattern of the flows of revenues and expenditures. Such measures do not always require a legal or any other formal act. They can actually be taken at all government levels often with a very short notice. Some measures may reflect the almost automatic response of government to

---

20 An additional controversial issue is whether fiscal projections should include policy measures which have not yet been well specified, but which it is implicitly known that they will be implemented at some point in order for governments to meet their budgetary targets. If a government has credibly committed to meet its target, then some policy measures could be expected to be implemented for this endeavour. In this respect there are sometimes reasons for the projections to depart from a no-policy-change norm (see EC 2005b for a discussion of the no-policy change norm). Especially for expenditure items mostly determined by discretionary decisions (for instance, subsidies, purchases of goods and services, investment) a most-likely norm based on past heuristic experience could be preferred to a simple extrapolation of past developments.

21 Special factors with a temporary or permanent influence on the government budget balance include the postponement of private and public sector wage payments to the following years, changes in the distributed profits to the government from the national central bank and public enterprises, exceptional tax revenue from the State owned companies, exceptional temporary spending freezes, postponement of investment and changes in the net EU payments in the EU member countries.

developments that are beyond its direct control. Measures only affecting the debt level often involve sales of public assets (e.g., privatisations) which do not change the government net worth.

The identification of temporary measures is a complex task. There is no clear categorisation of temporary measures that fits all national budgetary procedures and practices in spite of the increased harmonisation of government finance statistics in the EU. One way to classify temporary measures is according to the nature of their impact on the fiscal position by dividing them into one-off and self-reversing measures.

One-off measures comprise all measures which have an effect on the general government budget balance or gross debt the year they occur or for a few years. The measures that affect directly the level of deficit include, for example, measures raising government revenues for a specific period of time, like temporary increases in tax and social contribution rates, tax amnesties and tax settlement schemes, shortening of tax payment lags, exceptional sales of licences,<sup>22</sup> and exceptional sales of government-owned real estate.<sup>23</sup> Privatisation receipts, the government agencies' and social security funds' purchases of securities issued by the government, and gold sales, are measures that influence the level of debt.

Self-reversing measures consist of all measures which either improve or worsen the budgetary position in a specific period at the expense of, or to the benefit of future budgetary positions. Measures directly affecting the deficit include, for example, measures raising government tax revenue for a specific period of time and commitment for later repayment, securitisation of taxes and social contribution arrears, one-off tax prepayments, special revenue in exchange for the taking-over of future pension obligations, sale and rent back operations, as well as the use of interest rate swaps and other financial instruments.<sup>24</sup> The securitisation of interest-bearing assets held by the government are measures influencing only the debt.

### 4.3 Forecasting horizon

Fiscal projections can generally be divided into short-term, medium-term and long-term forecasts. The generation of budgetary forecasts at different horizons is mainly driven by the specific objectives of the analysis.

---

22 A paradigmatic case that has been distorting fiscal figures over the last few years is that of the sale of Universal Mobile Telecommunications System (UMTS) licenses in a number of European countries between 2000 and 2005. An extreme example is the case of Germany, where the proceeds amounted to 2.5% of GDP in 2000, thus leading the government deficit in ESA95 terms to a surplus of 1.3% of GDP in that year, that would have turned into a deficit of 1.1% of GDP excluding those exceptional revenues.

23 Recently, the government of Belgium has made extensive use of these sorts of measures. For example, the proceeds of the sale of the embassy in Tokyo amounted to some 0.1% of GDP in 2006, and some additional sales of real estate property in the latest years has contributed considerably to debt reduction.

24 This phenomenon has been so important that the target government deficit relevant for the Excessive Deficit Procedure (EDP) – the EDP deficit – is different from the standard national accounts definition of budget balance. The maintenance of a parallel definition of “government deficit” is a usual source of confusion for the communication with the European informed citizens. The quantitative differences between both definitions tend to be small. Nevertheless, for some countries, in some particular years, they can be non-negligible: for example in Italy in 2005 settlements under swaps and FRAs amounted to 0.2% of GDP.

### *Short-term budgetary forecasts*

Short-term budgetary forecasts normally cover a time period of up to one year. They are mostly prepared by government institutions for budgeting and management purposes. Monthly and quarterly cash figures on individual government revenue and expenditure items, as well as on net borrowing, provide useful indicators of the most recent budgetary developments. They can be of particular use in fiscal monitoring and when preparing or updating annual fiscal projections. This is primarily because they serve as “early warning” indicators, and provide timely information in case the actual revenue and expenditure developments or trends deviate significantly from their projected annual path, especially towards the end of the year. The existing intra-annual fiscal information in Europe has no formal role in EU regulations as regards its use in multilateral surveillance. There are two main sources of intra-annual information that could be potentially integrated in the EU multilateral surveillance process.

The first source is quarterly ESA95 government finance statistics. A number of EU regulations have addressed this issue over the last five years, but only recently (April 2006) Eurostat initiated the dissemination of deficit data at the country level, for a subset of EU member states. The usefulness of this new data set is still limited by its lack of timeliness (90 days’ theoretical publication lag, but substantially longer in practice), consistency with annual aggregates, sample size and quality.<sup>25</sup> The debate on quarterly government finance statistics remains at the level of Eurostat and national statistical agencies, with the exception of the paper by Pedregal and Pérez (2007) that makes a strong case for their use as a regular tool in EU fiscal surveillance.

The second source of intra-year fiscal information is governments’ public accounts. Monthly and quarterly cash data of the central government sector and other sub-sectors of the general government are published regularly and promptly, with a wide coverage of revenue and expenditure categories. Their use tends to be controversial in the policy arena given concerns about coverage (usually limited to central government) and statistical definitions (cash-basis versus accrual principle in national accounts). The only academic paper that analyses the link of cash deficits and annual ESA95 deficits in Europe is Pérez (2007) that finds strong evidence to support the use of cash deficit figures for a panel of nine euro area countries. Other related papers that analyse the properties of cash figures to monitor annual cash outcomes are the country studies by Kinnunen (1999) for Finland, and Silvestrini *et al.* (2007), for France.

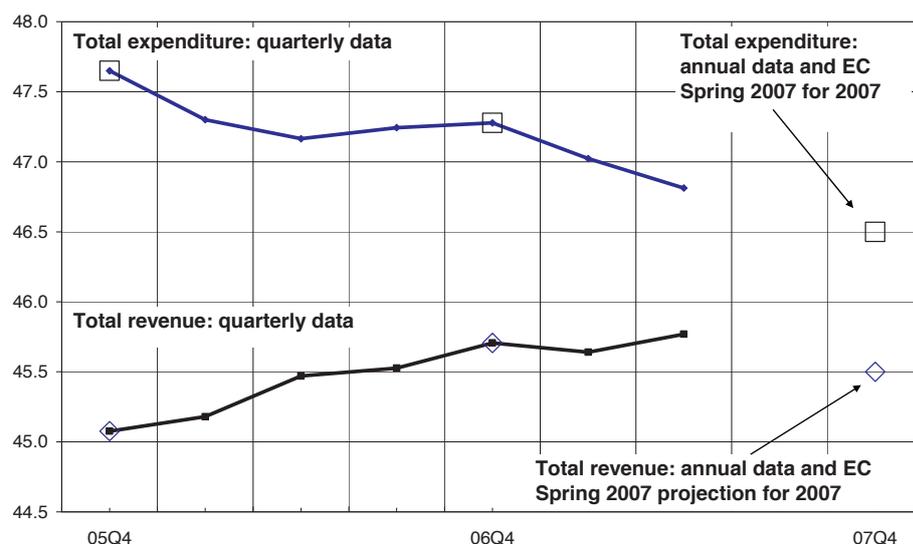
Recently European organisations have moved towards integrating quarterly fiscal data in the short-term assessment of annual budgetary targets and projections as, for example, in EC (2007, Part II, Chapter 2), or the regular issues of the ECB’s Monthly Bulletin. Figure 6 is based on the one that appears in the latter publication but including EC spring 2007 projections. It shows some rough evidence on how quarterly fiscal information available in October 2007 (up to 2007Q2) showed signs of downward risks on spring

---

<sup>25</sup> For an overview of the quarterly government finance statistics see ECB (2004) and EC (2007).

2007 EC projections for government expenditure, and upside risks regarding government revenue projections. Indeed, the most recent EC update (Autumn 2007) has revised government expenditure downwards and government revenue upwards.

**Figure 6: Short-term fiscal data.** Qualitative use of quarterly government finance statistics for the euro area, to monitor EC projections for the current year (example for year 2007, with information available in October 2007).



Source: authors' calculations based on Eurostat data. EC projections taken from EC (2007).

### Medium-term budgetary forecasts

Medium-term budgetary forecasts cover a time period of 2 to 5 years. They are prepared by the ministries of finance for domestic economic and fiscal policy planning as well as for the EU budgetary surveillance process. They are reported in the stability and convergence programmes. The multi annual projections for domestic purposes are normally rather detailed and include figures for the different government sub-sectors and the various individual revenue and expenditure categories. The fiscal targets set out in the stability and convergence programmes updates are usually much less disaggregated than those produced for national budgetary purposes. They normally only cover projections for the general government net borrowing/net lending and its sub-sectors, the main revenue and expenditure components at the general government level, and include a description of the various factors explaining the developments in the government debt ratio (Artis and Buti 2000, Sentance *et al.* 1998).

The EC, the ECB, the IMF, the OECD, National Central Banks and research institutes also produce medium-term budgetary forecasts in the context of their broader macroeconomic and inflation projection exercises (see EC 2007, IMF 2007, OECD 2007, and ECB 2001). These independent budgetary forecasts allow them to evaluate the effect of fiscal policy on economic activity and price formation, identify possible risks underlying the official budgetary targets, and recognise fiscal challenges. In this way, the

fiscal projections produced by the central banks provide additional valuable information to monetary policy decision making. They also enable the various organisations to check the implementation of fiscal policy, participate actively in the economic and fiscal policy related discussions at both the international and national level, and give recommendations on structural fiscal policy to individual countries.

Regarding the medium-term budgetary forecasts, there is a compelling need to ensure that they are in line with the projected evolution of relevant macroeconomic bases. Otherwise, the risk of introducing significant forecast errors in the cyclically sensitive government revenue and expenditure items and eventually also in government net borrowing/net lending, as well as gross debt, would emerge. This is even more important than with the projections covering shorter time periods. In this respect, transparency in terms of the macroeconomic assumptions underlying a given set of fiscal projections is conducive to a correct assessment of fiscal policy, and facilitates the comparison between forecasts made by different institutions.

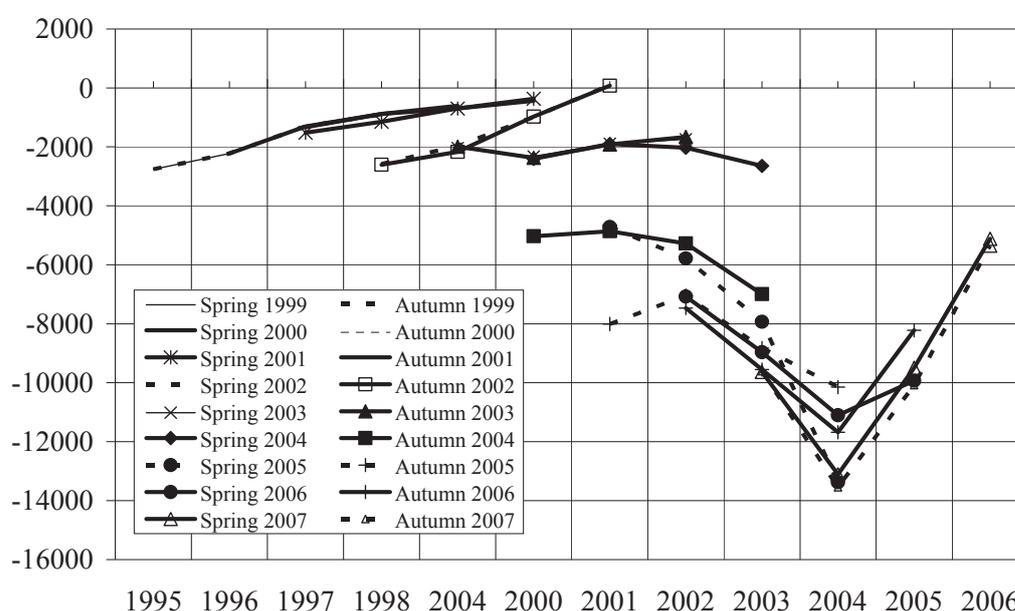
Revisions of past fiscal data have been especially important in some European countries during the last decade, as reported by Gordo and Nogueira-Martins (2007) or Balassone *et al.* (2007), and exemplified in Figure 7 for the cases of Greece. Frequent past data revisions imply shifts in subsequent targeted/projected paths over the medium-term given that government targets and projections are linked to the base year in which these targets/projections are produced. When sizeable revisions of fiscal data become a stylised fact, the credibility of government targets is at stake. In the cases in which revisions do not present a clear recurrent pattern, but are nonetheless frequent, the comparison of successive paths of governments' targets might be blurred, and may eventually undermine the soundness and consistency of fiscal policy choices over time.

In view of their relevance in both European and domestic fiscal policy discussions, medium-term fiscal projections often face the risk of being politicised. In this respect, it is a good forecasting practice to clearly distinguish medium-term fiscal targets from forecasts. Fiscal targets inherently assume that fiscal policy measures will be implemented in order to meet them. On the other hand, fiscal forecasts would contribute to highlighting the fiscal adjustment needed to fulfil government targets and could therefore be based on a prudent policy scenario, which takes into account only well-specified and credibly-announced policy measures (EC 2005b). This is a key methodological difference<sup>26</sup> which becomes blurred when budgetary forecasts are politicised.

---

<sup>26</sup> An example of good practice in this respect can be found in some recent documents by the Italian Treasury (see Italian Ministry of Economics 2007).

**Figure 7. The impact of data revisions.** Revisions to the government deficit (billion of euro) in Greece. The figure shows successive vintages of fiscal data as reported in Eurostat's Spring and Autumn Excessive Deficit Procedure (EDP) Notifications in some selected years.



Sources: authors' calculations on the basis of Eurostat data (successive EDP notifications for the years 1999-2006).

### *Long-term budgetary forecasts*

Long-term budgetary forecasts covering a period beyond 5 years and up to several decades aim to estimate the budgetary pressures stemming from population ageing particularly in the areas of pension-related expenditure and healthcare. They allow for an assessment of fiscal sustainability and help to identify potential needs for structural reforms in social expenditure. Long-term baseline projections or exogenous assumptions on public finances are also needed for macroeconomic model simulation purposes.<sup>27</sup>

Initially, long-term budgetary projections were mainly prepared by international economic organisations.<sup>28</sup> The increased awareness of the budgetary challenges posed by population ageing, which long-term projections contributed to revealing, has made them a regular exercise in ministries of finance, central banks and national research institutes.<sup>29</sup> In Europe they contribute to the annual assessment of stability and convergence programmes in the context of the Stability and Growth Pact.

There are three main methodological approaches to fiscal sustainability assessments based on long-term budgetary forecasts. First, sustainability gap indicators aim to evaluate by how much taxes should be increased, or, alternatively, expenditure reduced, to keep the debt ratio constant by the end of the forecast

<sup>27</sup> Regarding the use of fiscal policy rules in macro econometric models see for example, Perez and Hiebert (2004).

<sup>28</sup> For cross-country studies see, for example, Fore et al. (1995), Roseveare et al. (1995) or Franco and Munzi (1997).

<sup>29</sup> For individual country studies see, for example, Franco and Marino (2004), Lagergren (2004), Montanino (2004), or Nodgaard (2003).

horizon or to fulfil the government intertemporal budget constraint (for methodological aspects and procedures see Blanchard *et al.* 1991, Franco and Munzi 1997, or Giammarioli *et al.* 2007). Second, generational accounting (see Auerbach *et al.* 1991 or Raffelhueschen 1997) adopts a microeconomic perspective to estimate the financial burdens imposed on different age groups and generations. Sustainability assessments based on long-term projections should always be interpreted with caution, as they rely on a number of exogenous assumptions regarding for example real GDP growth, inflation, interest rates and demographic changes, and do not account for the implications of population ageing on consumption, investment and savings decisions or relative prices and interest rates. The third approach, based on general equilibrium models,<sup>30</sup> does not suffer from these caveats. General equilibrium models, however, are more difficult to build and understand, and are eventually based on a number of modelling assumptions, which can also be disputed. Their policy conclusions are more nuanced and more difficult to communicate to the general public. Of these approaches, sustainability gap indicators and generational accounting have been the methodologies most frequently used in the context of policy discussions.

While long-term fiscal projections are surrounded by caveats, not least because of their sensitivity to exogenous assumptions, they provide useful guidance for economic policy by pointing to risks of unsustainable macroeconomic developments. They help policy makers to present in a concrete manner to the general public how population ageing will influence public finances. By increasing awareness of budgetary challenges, they may also help governments to win public support for frontloading the implementation of urgently needed structural reforms, thereby contributing to better, more forward-looking, fiscal policy making.

#### **4.4 The level of disaggregation**

How detailed should fiscal forecasts be? While affected by data availability and the amount of resources devoted to fiscal forecasting, the reply to this question largely depends on the objective of the analysis. The key question in this respect is whether the main focus is to make a forecast for the general government net borrowing / net lending or to get a more detailed picture of developments in general government accounts and its sub-sectors. Ministries of finance, central banks, international economic organisations and national research institutes generally follow a bottom-up approach to budgetary forecasts (see Table 1 above). Projections for each individual tax and non-tax revenue component and main expenditure items are produced and then summed up to make total revenue and total expenditure. The net borrowing / net lending is computed as the difference between total revenue and total expenditure. Table 3 shows the level of detail of the ECB staff budgetary forecasts, which are based on a complete set of government accounts. This data set is described in the ECB Guideline of 17 February 2005 on the statistical reporting requirements of the European Central Bank and the procedures for

---

<sup>30</sup> See, for example, Ingenua Team (2001). Macro econometric models with a sufficiently detailed and well specified fiscal side and demographic factors can also be used for sustainability assessments (see Denton *et al.* 1999).

exchanging statistical information within the European System of Central Banks in the field of government finance statistics.<sup>31</sup>

The main advantages of a bottom-up approach are that it provides a fairly detailed picture of developments in government finances, and highlights the main factors driving the changes in budget balances. It also enables the checking of whether the forecasts are realistic in the light of the projected macroeconomic and price developments, as well as the planned discretionary changes in government revenue and expenditure, or to assess whether they are subject to significant upside or downside risks. Regarding possible disadvantages of this approach, it should be noted that the data requirements are relatively demanding.

**Table 3. Main fiscal variables**

| Deficit (-) or surplus (+)                     |                                                |
|------------------------------------------------|------------------------------------------------|
| Total revenue                                  | Total expenditure                              |
| Current revenue                                | Current expenditure                            |
| <i>Direct taxes</i>                            | <i>Current transfers</i>                       |
| of which by enterprises                        | Social payments                                |
| of which by households                         | Subsidies                                      |
| <i>Indirect taxes</i>                          | Other current transfers payable                |
| of which VAT                                   | <i>Interest</i>                                |
| <i>Social contributions</i>                    | <i>Compensation of employees</i>               |
| of which employers actual social contributions | <i>Intermediate consumption</i>                |
| of which employees social contributions        |                                                |
| <i>Other current transfers receivable</i>      |                                                |
| <i>Sales</i>                                   |                                                |
| Capital revenue                                | Capital expenditure                            |
| of which capital taxes                         | investment                                     |
|                                                | other net acquisitions of non-financial assets |
|                                                | capital transfers payable                      |
| Gross debt                                     |                                                |

Source: prepared by the authors.

Ministries of finance and other national authorities prepare more detailed budgetary forecasts than international economic organisations and financial market analysts. Their projections do not only cover the general government sector, but also entail very detailed forecasts for the different government sub-sectors including the central government, state, regions, local authorities and municipalities, pension funds and other social security funds. They also rely on very disaggregated projections regarding the various revenue and expenditure items, starting for example from taxes on automobiles, bicycles, motorbikes, alcohol, tobacco, and so on, up to total indirect taxes and total revenue.

31 See the ECB Guideline of 17 February 2005: [http://www.ecb.int/ecb/legal/pdf/l\\_10920050429en00810106.pdf](http://www.ecb.int/ecb/legal/pdf/l_10920050429en00810106.pdf), amended by the Guideline of 3 February 2006: [http://www.ecb.int/ecb/legal/pdf/l\\_04020060211en00320032.pdf](http://www.ecb.int/ecb/legal/pdf/l_04020060211en00320032.pdf)

Such a detailed approach can be very helpful, and even necessary, for budgeting purposes at the national level. This is the case for instance if there is a strong fiscal decentralisation and the central government sector covers only a relatively small part of the general government sector like in Germany (see Wendorff 2002). Focusing the analysis only on the general government level might result in significant forecast errors, since the driving forces and factors affecting the individual government revenue and expenditure items at the various government levels might deviate significantly from each other.

The main problem with a highly disaggregated approach is that it requires a considerable amount of resources to maintain the fiscal databases and to gather the information necessary for the budgetary projections. It should also be kept in mind that the very detailed statistical information at the sub-sectoral level is not even always available to all the institutions which produce forecasts or to the general public. Moreover, it is difficult to ensure that the highly disaggregated budgetary projections are consistent with the expected general macroeconomic and price developments. For this reason, if a very detailed approach is followed, top-down consistency checks should always be done to guarantee the overall consistency of the various forecasts (see Pike and Savage 1998).

## **5 Conclusions**

The Maastricht Treaty and the Stability and Growth Pact have increased interest in fiscal forecasting in Europe. While fiscal forecasting is viewed by many as an art rather than a science, there is general agreement that it should be based on transparent methods and clear procedures so that policy makers, market participants and the public at large have an accurate picture of budgetary developments. Transparency is needed to disentangle the impact of discretionary fiscal policy measures from that of macroeconomic developments or other factors, such as statistical changes. Despite the importance of having reliable quantitative predictions, good fiscal forecasts are not necessarily the best in the statistical sense, but do allow for a thorough understanding of budgetary developments, establishing a sound basis for fiscal policy making.

In democracies, governments are accountable for the use of public funds. The methodological distinction between targets and forecasts underpins any fruitful policy debate, allowing citizens, market participants and policy makers to make sound decisions. This holds true for any projection horizon. In the short-term, an adequate implementation of the budget needs to be based on clear indicators pointing to any difference between budget plans and realisation, so that governments can adjust revenue and expenditure in a timely manner, if deemed appropriate. Correcting differences between targets and outcomes is a fiscal policy decision, which policy makers might decide not to take, and in many cases for good reasons, but there can be no decision if there are no reliable indicators of fiscal developments. In the medium-term, this distinction allows citizens and policy makers to gauge the size of the fiscal adjustment that is still necessary to fulfil medium-term fiscal plans. Not highlighting this in budgetary forecasts, thereby making

them a duplication of budget targets, conveys an inadequate message to the public and allows policy makers to escape their responsibility of fulfilling their promises. This also weakens the accuracy of consumers' and market participants' expectations, ultimately exacerbating risks of abrupt adjustments in financial markets. Finally, the absence of such distinction would be simply absurd in the case of long-term projections, whose main aim is to highlight the long-term budgetary challenges with a view to taking timely correcting action before fiscal imbalances emerge and their correction becomes too costly.

All in all, the main message of this paper is that the technical analysis of budgetary developments should be expanded in many fields, like the use of short-term fiscal information, the fine-tuning of the techniques used in medium-term analysis or the regular analysis behind forecast errors. From the perspective of procedures and reporting of projections, these should be made more transparent and comprehensive. In these ways, final forecasts would be more focused on expertise and less on political considerations. Budgetary forecasts are a tool for policy makers to take appropriate fiscal policy decisions, and for the public to evaluate the need for such decisions, and to form sensible opinions on the success of their implementation.

## **Bibliography**

- Al-Eyd, A., R. Barrell (2005), "Estimating tax and benefit multipliers in Europe", *Economic Modelling* 22, p. 759-954.
- Artis M.J., M. Buti (2000), "'Close to balance or in Surplus': A Policy-maker's guide to the implementation of the Stability and Growth Pact", *Journal of Common Market Studies* 38, p. 563-591.
- Artis, M.J., M. Marcellino (2001), "Fiscal forecasting: The track record of the IMF, OECD and EC", *Econometrics Journal* 4, p. 20-36.
- Artis, M.J., M. Marcellino (1998), "Fiscal Solvency and Fiscal Forecasting in Europe", CEPR Discussion Paper 1836.
- Auerbach, A.J. (1999), "On the Performance and Use of Government Revenue Forecasts", *National Tax Journal* 52, p.765-782.
- Auerbach, A.J. (1996), "Dynamic Revenue Estimation", *Journal of Economic Perspectives* 10, p.141-157.
- Auerbach, A.J. (1995), "Tax Projections and the Budget: Lessons from the 1980's", *American Economic Review* 85, p.165-169.
- Auerbach, A. J., J. Gokhale, L. J. Kotlikoff (1991), "Generational accounts: a meaningful alternative to deficit accounting", Working Paper 9103, Federal Reserve Bank of Cleveland.
- Australian Treasury (2001), "The Macroeconomics of the Trym Model of the Australian Economy", Department of the Treasury of the Australian Commonwealth Government.
- Baguestani, H., R. McNown (1992), "Forecasting the Federal Budget with Time series Models", *Journal*

- of Forecasting* 11, p. 127-139.
- Balassone, F., D. Franco, S. Zotteri (2007), “The reliability of EMU fiscal indicators: risks and safeguards”, *Temi di Discussione* 633, Banca d’Italia.
- Bier, W., R. Mink, M. Rodríguez-Vives (2004), “Extended Statistics for the Support of the Stability and Growth Pact”, *Hacienda Pública Española*, Monografía 2004, p. 35-63.
- Blanchard, O., J.-C. Chouraqui, R. P. Hagemann, N. Sartor (1991), “The Sustainability of Fiscal Policy: New Answers to an Old Question” NBER Reprints 1547, NBER.
- Boughton, J. M. (1997), “Modeling the World Economic Outlook at the IMF - A Historical Review”, IMF Working Paper WP/97/48.
- Bouthevillain, C., P. Cour, G. van den Dool, P. Hernández, G. Langenus, M. Mohr, S. Momigliano, M. Tujula (2001), “Cyclically Adjusted Budget Balances: An Alternative Approach”, European Central Bank Working Paper 77.
- Bretschneider, S.I., W.L. Gorr, G. Grizzle, E. Klay (1989), “Political and organizational influences on the accuracy of forecasting state government revenues”, *International Journal of Forecasting* 5, p. 307-319.
- Bruck, T., A. Stephan (2006), “Do Eurozone Countries Cheat with their Budget Deficit Forecasts”, *Kyklos* 59, 3-15.
- Bryant R. C., L. Zhang (1996a), “Intertemporal fiscal policy in macroeconomic models: Introduction and major alternatives”, Discussion Paper in International Economics 123, Brookings Institution, Washington D.C.
- Bryant R. C., L. Zhang (1996b), “Alternative specifications of intertemporal fiscal policy in a small theoretical model”, Discussion Paper in International Economics 124, Brookings Institution, Washington D.C.
- Campbell, B., E. Ghysels (1995), “Federal Budget Projections: a nonparametric assessment of bias and efficiency”, *Review of Economics and Statistics* 77, p. 17-31.
- Cao, J.-G., B. Robidoux (1998), The Canadian Economic and Fiscal Model 1996 version, Department of Finance, Canada, Working Paper 98/07.
- Cassidy, G., M. S. Kamlet, D. S. Nagin (1989), “An empirical examination of bias in revenue forecasts by state governments”, *International Journal of Forecasting* 5, p. 321-331.
- Cohen, D., G. Follete (2002), “Forecasting Government Taxes and Spending in the United States: An Overview”, paper presented at the 1st centRA Workshop on Public Sector Forecasting and Monitoring, Seville 27-28 September 2002.
- Coletti, D., S. Murchison (2002), “Models in Policy Making”, *Bank of Canada Review* Summer 2002.
- Congressional Budget Office (1998), “Description of Economic Models”, CBO, Washington D.C., US.
- Congressional Budget Office (1997), “An Economic Model for Long-Run Budget Simulations”, CBO Memorandum, Washington D.C., US.

- Creedy, J., N. Gemmell (2005), “Wage growth and income tax revenue elasticities with endogenous labor supply”, *Economic Modelling* 22, p.21-38.
- Dalsgaard, T., A. de Serres (2001), “Estimating prudent budgetary margins for EU countries: a simulated SVAR model approach”, Chapter 9 in **The Stability and Growth Pact. The Architecture of Fiscal Policy in EMU**, A. Brunila, M. Buti, D. Franco (Eds.), Palgrave Publisher, Hampshire, United Kingdom.
- Denton, F. T., D. C. Mountain, B. G. Spencer (1999), “Age, Trend, and Cohort Effects in a Macro Model of Canadian Expenditure Patterns”, *Journal of Business and Economic Statistics* 17, p. 430-443.
- Diebold, F., R. Mariano (1995), “Comparing predictive accuracy”, *Journal of Business and Economic Statistics* 13, p. 253-263.
- Eschenbach, F., L. Schuknecht (2004), “Budgetary risks from real estate and stock markets”, *Economic Policy*, July, p. 313-346.
- European Central Bank (2004), “Properties and Use of General Government Quarterly Accounts”, ECB Monthly Bulletin, August issue.
- European Central Bank (2001), “A Guide to Eurosystem Staff Macroeconomic Projection Exercises”, European Central Bank, Frankfurt am Main, Germany, June.
- European Commission (2007), “Public Finances in EMU”, European Economy 3/2007, Directorate-General for Economic and Financial Affairs.
- European Commission (2006), “Public Finances in EMU”, European Economy 3/2006, Directorate-General for Economic and Financial Affairs.
- European Commission (2005a), “Guidelines on the format and content of Stability and Convergence Programmes”. European Commission, Brussels.
- European Commission (2005b), “Public Finances in EMU”, European Economy 3/2005, Directorate-General for Economic and Financial Affairs.
- European Commission (2002), “Opinion on the content and format of stability and convergence programmes (2001 code of conduct)”, extract of “Public Finances in EMU”, European Economy 3/2002, Directorate-General for Economic and Financial Affairs.
- Fagan, G., J. Henry, R. Mestre (2001), “An Area-Wide-Model (AWM) for the euro area”, European Central Bank Working Paper 42.
- Fagan, G., J. Morgan (eds.) (2005), **Econometric models of the euro-area central banks**, Edgar Elgar Publishing, Cheltenham, UK.
- Fatas, A., J. von Hagen, A. Hughes Hallet, R. Strauch, A. Sibert (2003), **Stability and Growth in Europe: Towards a better Pact**, Center for Economic Policy Research, London, UK.
- Favero, C., M. Marcellino (2005), “Modelling and forecasting fiscal variables for the euro area”, *Oxford Bulletin of Economics and Statistics* 67, p. 755-783.
- Feenberg, D.R., Gentry, W., Gilroy, D., Rosen, H.S. (1989), “Testing the rationality of State Revenue

- Forecasts”, *Review of Economics and Statistics* 71, p. 300-308.
- Fore, D., W. Leibfritz, D. Roseveare, E. Wurzel (1995), “Ageing Populations, Pension Systems and Government Budgets: How Do They Affect Saving?” OECD Economics Department WP 156.
- Franco, D., M. R. Marino (2004), “The role of long-term fiscal projections”, 3rd centA Workshop on Public Sector Forecasting and Monitoring, Seville 13-14 February.
- Franco D., T. Munzi (1997), “Ageing and Fiscal Policies in the European Union”, *European Economy*, n° 4, p. 239-358.
- Fullerton Jr., T.M. (1989), “A composite approach to forecasting state government revenues: Case study of the Idaho sales tax”, *International Journal of Forecasting* 5, p. 373-380.
- Gentry, W.M. (1989), “Do State Revenue Forecasters Utilize Available Information?”, *National Tax Journal* 42, p. 429-39.
- Giammarioli, N., C. Nickel, P. Rother, J-P. Vidal (2007), “Assessing fiscal soundness. Theory and practice”, European Central Bank, Occasional Paper Series No 56.
- Giles, C., J. Hall (1998), “Forecasting the PSBR Outside Government: The IFS Perspective”, *Fiscal Studies* 19, p. 83-100.
- Girouard, N., C. André (2005), “Measuring cyclically-adjusted budget balances for OECD countries”, OECD Economics Department Working Paper No. 434.
- Golosov, M., J. King (2002), “Tax Revenue Forecasts in IMF-Supported Programs”, International Monetary Fund, WP/02/236.
- Gordo, L., J. Nogueira Martins (2007), “How reliable are the statistics for the Stability and Growth Pact”, European Economy Economic Papers 273, European Commission, Brussels.
- Grizzle, G.A., W.E. Klay (1994), “Forecasting State Sales Tax Revenues: Comparing the Accuracy of Different Methods”, *State and Local Government Review* 26, p. 142-152.
- Holden, K., D. A. Peel (1990), “On testing for unbiasedness and efficiency of forecasts”, *The Manchester School* 63, p. 120-127.
- Holloway, T.M. (1989), “Measuring the cyclical sensitivity of federal receipts and expenditures: Simplified estimation procedures”, *International Journal of Forecasting* 5, p. 347-360.
- IMF (2007), “World Economic Outlook”, International Monetary Fund, September.
- Ingenue Team (2001), “Macroeconomic Consequences of Pension Reforms in Europe: an Investigation with the INGENUE World Model”, CEPII Document de travail No 01-17.
- Italian Ministry of Economics (2007), “2008-2011 Economic and Financial Planning Document”.
- Jennes, B., S. Arabackyj (1998), “Budget forecasting records of the federal and provincial governments”, *Monthly Economic Review* XVII, No. 1, Canada.
- Jonung, L., M. Larch (2006), “Fiscal policy in the EU: are official output forecasts biased?”, *Economic Policy*, July, p. 491-534.
- Keereman, F. (1999), “The track record of the Commission Forecasts”, Economic Papers 137.

- Kinnunen, H. (1999), “Cash Data for Central Government: Time Series Analysis”, Bank of Finland, Economics Department Working Papers.
- Koen, V., van den Noord, P. (2005), “Fiscal Gimmickry in Europe: One-off Measures and Creative Accounting”, OECD Economics Department Working Paper 417.
- Lagergren, M. (2004), “Health expenditure projections”, Paper presented at the 3rd centrA Workshop on Public Sector Forecasting and Monitoring, Seville 13-14 February 2004.
- Lawrence, K., A. Anandarajan, G. Kleinman (1998), “Forecasting State Tax Revenues: a new approach” in **Advances in Business and Management Forecasting**, Vol. 2, p. 157-170.
- Laxton, D., Isard, P., Faruquee, H., Prasad, E., Turtelboom, B., (1998). “MULTIMOD Mark III: The core dynamic and steady-state models”. Occasional Paper 164, IMF, Washington DC.
- Litterman, R.B., T.M. Supel (1983), “Using Vector Autoregressions to Measure the Uncertainty in Minnesota’s Revenue Forecasts”, *Federal Reserve Bank of Minneapolis Quarterly Review*, spring, p. 10-22.
- Mandy, D.M. (1989), “Forecasting Unemployment Insurance Trust Funds: The case of Tennessee”, *International Journal of Forecasting* 5, p. 381-391.
- Melander, A., G. Sismanidis, D. Grenouilleau (2007), “The track record of the Commission’s forecasts – an update”, European Economy, Economic Papers 291, DG ECFIN, European Commission, Brussels.
- Melliss, C. (1996), “The Treasury forecast record: an evaluation, ESCR Macroeconomic Modelling Bureau Discussion Paper no. 47.
- Melliss, C., R. Whittaker (1998), “The Treasury forecast record: some new results”, *National Institute Economic Review*, April, p. 65-79.
- Mendoza, E., A. Razin, L. Tesar (1994), “Effective Tax Rates in Macroeconomics: Cross-Country Estimates of Tax Rates on Factor Incomes and Consumption”, *Journal of Monetary Economics* 34, 297-323.
- Mocan, H. N., S. Azad (1995), “Accuracy and Rationality of State General Fund Revenue Forecasts: Evidence from Panel data”, *International Journal of Forecasting* 1, p. 417-427.
- Montanino, A. (2004), “Modelling long term trends in public education expenditure”, paper presented at the 3rd centrA Workshop on Public Sector Forecasting and Monitoring, Seville 13-14 February 2004.
- Moulin, L., P. Wierts (2006), “How Credible are Multiannual Budgetary Plans in the EU?”, in **Fiscal Indicators**, p. 983–1005, Banca d’Italia.
- Morris, R., L. L. Schuknecht (2007), “Structural balances and revenue windfalls - the role of asset prices revisited”, European Central Bank Working Paper 737.
- Mühleisen, M, S. Danninger, D. Hauner, K. Krajnyáck, B. Sutton (2005), “How do Canadian Budget Forecasts Compare with Those of Other Industrial Countries?”, IMF Working Paper WP/05/66.
- Musso, A., S. Phillips (2002), “Comparing Projections and Outcomes of IMF-Supported Programs”, IMF Staff Papers, Vol. 49, No. 1.

- Nazmi, N., J.H. Leuthold (1988), "Forecasting Economic Time Series that Require a Power Transformation: Case of State Tax Receipts", *Journal of Forecasting* 7, p. 173-184.
- Nodgaard, U. (2003), "Fiscal sustainability in Denmark - What are the policy implications?", Ministry of Economic and Business Affairs Denmark, mimeo.
- OECD (2007), "OECD Economic Outlook", No 82, September.
- Pedregal D., J. J. Pérez (2007), "Should quarterly government finance statistics be used for fiscal surveillance in Europe?", *manuscript*, European Central Bank.
- Pérez, J. J. (2007), "Leading Indicators for Euro Area Government deficits", *International Journal of Forecasting* 23, p. 259-275.
- Pérez, J. J., P. Hiebert (2004), "Identifying Endogenous Fiscal Policy Rules for Macroeconomic Models", *Journal of Policy Modeling* 26, pp. 1073-1089.
- Pesaran M. H., A. Timmermann (1992), "A simple nonparametric test of predictive performance", *Journal of Business and Economic Statistics* 10, p. 461-465.
- Pike, T., Savage, D. (1998), "Forecasting the Public Finances in the Treasury", *Fiscal Studies* 19, p. 49-62.
- Plesko, G.A. (1988), "The accuracy of government forecasts and budget projections", *National Tax Journal* 41, p. 483-501.
- Pons, J. (2000), "The accuracy of IMF and OECD forecasts for G-7 countries", *Journal of Forecasting* 19, p. 53-63.
- Raffelhueschen, B. (1999), "Generational Accounting in Europe", *American Economic Review* 89, p. 167-170.
- Richardson, P. (1987), "A review of the simulation properties of OECD's INTERLINK Model", OECD Economics Department Working Paper 47 (July).
- Roeger W., J. in't Veld (2002), "Some selected simulation experiments with the European Commission's QUEST model". *European Economy* 178, October.
- Roeger W., J. in't Veld (1997), "QUEST: A multi-country business cycle and growth model". European Commission paper II/505-97-EN.
- Rodgers, R., P. Joyce (1996), "The effect of Underforecasting on the Accuracy of Revenue Forecasts by State Governments." *Public Administration Review* 56, p. 48-56.
- Roseveare, D., W. Leibfritz, D. Fore, E. Wurtzel (1995), "Ageing populations, pension systems and government budgets: simulations for 20 countries?", OECD Economics Department Working Paper 168.
- Sentance, A., S. Hall, J. O'Sullivan (1998), "Modelling and Forecasting UK Public Finances", *Fiscal Studies* 19, p. 63-81.
- Shkurti, W.J., D. Winefordner (1989), "The politics of state revenue forecasting in Ohio, 1984-1987: A case study and research implications", *International Journal of Forecasting* 5, p. 361-371.

- Silvestrini A., M. Salto, L. Moulin L., D. Veredas (2007). "Monitoring and forecasting annual public finance deficit every month: the case of France". *Empirical Economics*, forthcoming.
- Strauch, R., M. Hallerberg, J. Von Hagen (2004), "Budgetary Forecasts in Europe – The Track Record of Stability and Coverage Programmes", European Central Bank WP 307.
- Szeto, K. L., P. Gardiner, R. Gray, D. Hargreaves (2003), "A Comparison of the NZTM and FPS Models of the NZ Economy", New Zealand Treasury Working Paper 03/25.
- Swiston, A., M. Mühleisen, K. Mathai (2007), "US revenue surprises: are happy days here to stay?", IMF Working Paper WP/07/143.
- Tridimas, G. (1992), "Budgetary deficits and government expenditure growth: toward a more accurate empirical specification", *Public Finance Quarterly* 20, p. 275-297.
- Van den Noord, P. (2000), "The size and role of automatic fiscal stabilisers in the 1990s and beyond", OECD Economics Department Working Paper 230.
- Wendorff, K. (2002), "Fiscal forecasting at the Deutsche Bundesbank", paper presented at the 2002 centra Workshop on Public Sector Forecasting and Monitoring, Seville, Spain..
- West, K. D., M. W. McCracken (1998), "Regression-based tests of predictive ability", *International Economic Review* 39, p. 817-840.
- Willman, A., M. Kortelainen, H.-L. Männistö, M. Tujula (2000), "The BOF5 macroeconomic model of Finland, structure and dynamic microfoundations", *Economic Modeling* 17, p. 275-303.
- Wolswijk, G. (2007), "Short- and long-run tax elasticities: the case of the Netherlands", European Central Bank Working Paper 763.

## European Central Bank Working Paper Series

For a complete list of Working Papers published by the ECB, please visit the ECB's website (<http://www.ecb.europa.eu>).

- 807 "Cross-border lending contagion in multinational banks" by A. Derviz and J. Podpiera, September 2007.
- 808 "Model misspecification, the equilibrium natural interest rate and the equity premium" by O. Tristani, September 2007.
- 809 "Is the New Keynesian Phillips curve flat?" by K. Kuester, G. J. Müller und S. Stölting, September 2007.
- 810 "Inflation persistence: euro area and new EU Member States" by M. Franta, B. Saxa and K. Šmídková, September 2007.
- 811 "Instability and nonlinearity in the euro area Phillips curve" by A. Musso, L. Stracca and D. van Dijk, September 2007.
- 812 "The uncovered return parity condition" by L. Cappiello and R. A. De Santis, September 2007.
- 813 "The role of the exchange rate for adjustment in boom and bust episodes" by R. Martin, L. Schuknecht and I. Vansteenkiste, September 2007.
- 814 "Choice of currency in bond issuance and the international role of currencies" by N. Siegfried, E. Simeonova and C. Vespro, September 2007.
- 815 "Do international portfolio investors follow firms' foreign investment decisions?" by R. A. De Santis and P. Ehling, September 2007.
- 816 "The role of credit aggregates and asset prices in the transmission mechanism: a comparison between the euro area and the US" by S. Kaufmann and M. T. Valderrama, September 2007.
- 817 "Convergence and anchoring of yield curves in the euro area" by M. Ehrmann, M. Fratzscher, R. S. Gürkaynak and E. T. Swanson, October 2007.
- 818 "Is time ripe for price level path stability?" by V. Gaspar, F. Smets and D. Vestin, October 2007.
- 819 "Proximity and linkages among coalition participants: a new voting power measure applied to the International Monetary Fund" by J. Reynaud, C. Thimann and L. Gatarek, October 2007.
- 820 "What do we really know about fiscal sustainability in the EU? A panel data diagnostic" by A. Afonso and C. Rault, October 2007.
- 821 "Social value of public information: testing the limits to transparency" by M. Ehrmann and M. Fratzscher, October 2007.
- 822 "Exchange rate pass-through to trade prices: the role of non-linearities and asymmetries" by M. Bussière, October 2007.
- 823 "Modelling Ireland's exchange rates: from EMS to EMU" by D. Bond and M. J. Harrison and E. J. O'Brien, October 2007.
- 824 "Evolving U.S. monetary policy and the decline of inflation predictability" by L. Benati and P. Surico, October 2007.

- 825 “What can probability forecasts tell us about inflation risks?” by J. A. García and A. Manzanares, October 2007.
- 826 “Risk sharing, finance and institutions in international portfolios” by M. Fratzscher and J. Imbs, October 2007.
- 827 “How is real convergence driving nominal convergence in the new EU Member States?” by S. M. Lein-Rupprecht, M. A. León-Ledesma, and C. Nerlich, November 2007.
- 828 “Potential output growth in several industrialised countries: a comparison” by C. Cahn and A. Saint-Guilhem, November 2007.
- 829 “Modelling inflation in China: a regional perspective” by A. Mehrotra, T. Peltonen and A. Santos Rivera, November 2007.
- 830 “The term structure of euro area break-even inflation rates: the impact of seasonality” by J. Ejsing, J. A. García and T. Werner, November 2007.
- 831 “Hierarchical Markov normal mixture models with applications to financial asset returns” by J. Geweke and G. Amisano, November 2007.
- 832 “The yield curve and macroeconomic dynamics” by P. Hördahl, O. Tristani and D. Vestin, November 2007.
- 833 “Explaining and forecasting euro area exports: which competitiveness indicator performs best?” by M. Ca’ Zorzi and B. Schnatz, November 2007.
- 834 “International frictions and optimal monetary policy cooperation: analytical solutions” by M. Darracq Pariès, November 2007.
- 835 “US shocks and global exchange rate configurations” by M. Fratzscher, November 2007.
- 836 “Reporting biases and survey results: evidence from European professional forecasters” by J. A. García and A. Manzanares, December 2007.
- 837 “Monetary policy and core inflation” by M. Lenza, December 2007.
- 838 “Securitisation and the bank lending channel” by Y. Altunbas, L. Gambacorta and D. Marqués, December 2007.
- 839 “Are there oil currencies? The real exchange rate of oil exporting countries” by M. M. Habib and M. Manolova Kalamova, December 2007.
- 840 “Downward wage rigidity for different workers and firms: an evaluation for Belgium using the IWFP procedure” by P. Du Caju, C. Fuss and L. Wintr, December 2007.
- 841 “Should we take inside money seriously?” by L. Stracca, December 2007.
- 842 “Saving behaviour and global imbalances: the role of emerging market economies” by G. Ferrucci and C. Miralles, December 2007.
- 843 “Fiscal forecasting: lessons from the literature and challenges” by T. Leal, J. J. Pérez, M. Tujula and J.-P. Vidal, December 2007.

ISSN 1561-0810



9 771561 081005