

Rülke, Jan-Christoph; Pierdzioch, Christian

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# Government Forecasts of Budget Balances Under Asymmetric Loss: International Evidence

Christian Pierdzioch\* and Jan-Christoph Rülke†

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## Abstract

We study the loss function of 15 European governments as implied by their budget balance forecasts. Results suggest that the shape of the loss function varies across countries. The loss function becomes more asymmetric as the forecast horizon increases and in advance of parliamentary election. Compared to that, government ideology does not affect the shape of the loss function. Under a fiscal rule, government agencies experience a higher loss when overpredicting the fiscal balance compared to an underprediction of the same size. We also document that under an asymmetric loss function government forecasts look more rational compared to a symmetric loss function. This may explain why government agencies' forecasts have been found to be too optimistic (Frankel 2012).

**JEL classification:** E62, H50, E27

**Keywords:** fiscal balance, forecasting, asymmetric loss function, fiscal rule

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\*Corresponding author: Helmut-Schmidt-University, Department of Economics, Holstenhofweg 85, P.O.B. 700822, D-22008 Hamburg, Email: c.pierdzioch@hsuwh.de

†WHU - Otto Beisheim School of Management, Department of Economics, Burgplatz 2, D-56179 Vallendar, Email: jan-c.ruelke@whu.edu

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## 1 Introduction

Governments' budget-balance forecasts are an important economic indicator of future fiscal developments. They are, thus, of interest for different reasons. First, financial market participants may use budget-balance forecasts as an indicator of a government's commitment to future fiscal consolidation. Nickel et al. (2011) show that an increase in the budget balance forecast by one percent decreases the bond spread in Eastern European countries by four basis points. Second, governments' budget-balance forecasts may also be important from a business-cycle perspective. Because such forecasts are an indicator of future government expenditures and tax revenues, budget-balance forecasts may be a useful indicator of whether a government follows a pro-cyclical or an anti-cyclical fiscal policy. Forecasts of future government budget surpluses may also signal a crowding out of investment and consumption. Third, budget-balance forecasts are one pillar needed to implement fiscal rules, such as the Stability and Growth Pact. Hence, a government's budget-balance forecasts are important for evaluating whether a country complies with such a fiscal rule. For example, the European Commission (EC) regularly assesses the budget-balance forecasts of the European Union (EU) member states with regard to fiscal sustainability. Also, the International Monetary Fund (IMF) particularly focuses on a government's assessment of the future fiscal outlook when advising a country with regard to financial and economic policies. Governments, in turn, may use their budget-balance forecasts to signal their willingness and commitment to act on the IMF's advice. If a country is in a state of economic or financial crisis, financial support by the IMF and access to international financial markets are likely to depend to a significant extent on a government's budget-balance forecast.

This raises the question of whether governments' budget-balance forecasts are accurate and unbiased. There are a number of good reasons for why governments should submit accurate forecasts, including reasons like gaining credibility and promoting economic stability through fiscal foresight (Drazen 2004). A key stylized fact in fiscal policy, however, is that government agencies tend to be too optimistic when forecasting their fiscal balance. In a comprehensive cross-country study, Frankel (2012) reports

that budget-balance forecasts of government agencies have a positive average bias. Merola and Perez (2012) find a political-economy bias in the fiscal forecast record of governments and international organizations. Corroborating this optimistic bias, Beetsma et al. (2009) report in another recent study of European countries that actual fiscal balances systematically fall short of official ex-ante plans. Studying the optimistic bias in forecasts of government agencies is important as it may help to explain excessive budget deficits and the failure of countercyclical fiscal policy during economic booms. An optimistic bias in forecasts can be rational if government agencies and politicians, perhaps due to political-economy considerations (Jonung and Larch 2006), have an asymmetric loss function. In fact, Elliott et al. (2005) provide evidence of an asymmetric loss function based on government deficit forecasts made by the IMF and the OECD. Christodoulakis and Mamatzakis (2008, 2009), who study EC forecasts, also find some evidence of an asymmetric loss function. Artis and Marcellino (2001) analyze asymmetries using IMF forecasts for the G7 countries and find, for some countries including Canada and France, that the IMF prefers an underprediction of the fiscal balance. For other countries including Italy, Japan, and the United Kingdom, the IMF seems to prefer an overprediction.

We follow the research by Elliott et al. (2005) and Christodoulakis and Mamatzakis (2008, 2009) and ask whether the loss function of government agencies is asymmetric. This would be the case if, for example, government agencies perceive the loss incurred in the case of an overprediction of the fiscal balance to be higher than the loss of an underprediction of the same size. We also ask whether government agencies' forecasts can be regarded as rational under the assumption of an asymmetric loss function. Importantly, we go beyond earlier research in that we ask whether governments' ideology, elections or the introduction of a fiscal rule changes the perceived loss of over- and underpredictions. This is an important research question because Frankel (2012) reports that countries subject to a fiscal rule make official forecasts of growth and budget deficits that are even more biased compared to other countries. In order to answer our research questions, we model the loss function of official government agencies using the approach developed by Elliott et al. (2005). This approach, which backs out the parameters of the loss function from historical forecast

errors, has been extensively used in recent research to study forecasts of government agencies. For example, Auffhammer (2007) uses this approach to study the forecasts published by the United States Energy Information Administration. Pierdzioch et al. (2011) apply the approach advanced by Elliott et al. (2005) to evaluate forecasts published by the Bank of Canada. We use their approach to study the data set of forecasts made by official national government agencies compiled by Frankel (2012) and De Castro et al. (2013). Specifically, we study fiscal balance forecasts of official national government agencies for 15 European economies to explore whether an asymmetric loss function can rationalize an optimistic bias.

Our results imply that the loss function of official government agencies varies across countries. Based on current-year forecasts, we group countries into three categories. The first category contains countries whose government agencies incur a higher loss when overpredicting the fiscal balance than when realizing an underprediction of the same size. This category mainly includes the Benelux and northern European countries. The second category comprises countries whose government agencies' seem to have a symmetric loss function. This category comprises *inter alia* France and Germany. The third category of countries contains Greece and Italy perceive a higher loss when underpredicting the fiscal balance indicating that they are afraid of excessive budget deficits. Moreover, assuming an asymmetric loss function makes governments' forecasts look more rational. Finally, we report that the asymmetry of the loss function becomes more pronounced if before parliamentary elections. Compared to that, under a fiscal rule, governments are more concerned to provide a rosy fiscal outlook. The asymmetry of the loss function, however, does not depend on the ideology of incumbent governments. Results further suggest that the loss function becomes more asymmetric as the forecast horizon increases, showing that government agencies seem to incur a higher loss in the case of an underprediction of the fiscal balance as compared to an overprediction of the same size. This result confirms Frankel's (2012) findings, who shows that government agencies are even more optimistic when they form longer-term forecasts.

Our results add to the recent controversy on the effectiveness of fiscal

rules such as the Stability and Growth Pact. An important question is whether such rules help to improve the credibility of a commitment to fiscal discipline (Drazen 2004, Braun and Tommasi 2004). Our results suggest that a fiscal rule does not necessarily help to overcome an optimistic bias in government agencies forecasts. One could think of several reasons for why a fiscal rule does not help in this respect. Drazen (2004), for example, points out that the effectiveness of a fiscal rule depends on whether it helps to remedy a potential fiscal bias and whether it specifies costs politicians pay when they deviate or even change the rule.

The remainder of this research is organized as follows. In Section 2, we present the approach that we use to model the functional form of the loss function. In Section 3, we present our data while Section 4 summarizes our results and provides some robustness tests. In Section 5, we offer some concluding remarks.

## 2 Modeling an asymmetric loss function

We use the approach developed by Elliott et al. (2005) to study the shape of official government agencies' loss function. The idea underlying their approach is that the forecast errors can be used to make inferences regarding the shape of a forecaster's loss function. Moreover, conditional on the shape of a forecaster's loss function, a test of forecast rationality can be constructed.<sup>1</sup>

The approach rests on the assumption that the loss function,  $\mathcal{L}$ , of a forecaster can be described in terms of the following general functional form:

$$\mathcal{L}(s_{t+1}, f_{t+1}, \alpha, p) = [\alpha + (1 - 2\alpha)I(s_{t+1} - f_{t+1} < 0)]|s_{t+1} - f_{t+1}|^p, \quad (1)$$

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<sup>1</sup>The approach of Elliott et al. (2005) is generalized in Patton and Timmermann (2007a,b). For a further analysis of their approach, see Elliott et al. (2008). For an alternative approach to the modeling of an asymmetric loss function, see Batchelor and Peel (1998). The issue of an asymmetric loss function has also gained prominence in the literature on central bank preferences. See, for example, Surico (2008), and Pierdzioch et al. (2011), to name just a few. Minford and Srinivasan (2008) point out that a nonlinear economic structure may give results that resemble the results obtained based on an asymmetric policy function.

where  $f_{t+1}$  denotes the forecast submitted by the government in period  $t$  of the budget balance to be realized one-period ahead (where we arbitrarily scale the forecast horizon to one period). This realization is denoted by  $s_{t+1}$ . Thus, the forecast error is defined as  $s_{t+1} - f_{t+1}$ . The expression  $I(\cdot)$  denotes the indicator function. The parameter  $p$  governs the general functional form of the loss function, where a lin-lin loss function obtains for  $p = 1$ , and a quad-quad loss function results if one sets  $p = 2$  in econometric exercise. The parameter  $\alpha \in (0, 1)$  governs the degree of asymmetry of the loss function and is our primary parameter of interest. A symmetric loss function results in the case of  $\alpha = 0.5$ . For  $\alpha > 0.5$  underpredicting the budget balance causes a higher loss than overpredicting. For  $\alpha < 0.5$ , in turn, overpredicting is more costly than underpredicting. For  $\alpha = 0.5$  and  $p = 2$ , the loss a forecaster incurs increases in the squared forecast error. For  $\alpha = 0.5$  and  $p = 1$ , the loss increases in the absolute forecast error.

Elliott et al. (2005) show that, for a given parameter  $p$ , the asymmetry parameter,  $\alpha$ , can be consistently estimated by means of a Generalized Method of Moments (GMM) approach, which gives the following estimator:

$$\hat{\alpha} = \frac{\hat{\gamma}_1' \hat{S}^{-1} \hat{\gamma}_2}{\hat{\gamma}_1' \hat{S}^{-1} \hat{\gamma}_1}, \quad (2)$$

where we define

$$\hat{\gamma}_1 = \left[ \frac{1}{T} \sum_{t=\tau}^{T+\tau-1} v_t |s_{t+1} - f_{t+1}|^{p-1} \right] \quad (3)$$

and

$$\hat{\gamma}_2 = \left[ \frac{1}{T} \sum_{t=\tau}^{T+\tau-1} v_t I(s_{t+1} - f_{t+1} < 0) |s_{t+1} - f_{t+1}|^{p-1} \right], \quad (4)$$

and the vector of instruments,  $v_t$ , is used to estimate a weighting matrix given by

$$\hat{S} = \frac{1}{T} \sum_{t=\tau}^{T+\tau-1} v_t v_t' (I(s_{t+1} - f_{t+1} < 0) - \hat{\alpha})^2 |s_{t+1} - f_{t+1}|^{2p-2}. \quad (5)$$

The number of forecasts, starting in period  $\tau + 1$ , is given by  $T$ . With

a weighting matrix depending on  $\hat{\alpha}$ , estimation is done iteratively. As instruments we consider a constant (Model 1), a constant and the lagged actual value (Model 2), a constant and the lagged inflation rate (Model 3), and a constant, the lagged inflation rate and the lagged treasury bill rate (Model 4). These macroeconomic variables are regarded to be economically meaningful for the budget-balance forecast errors (Artis and Marcellino 2001, Poplawski-Ribeiro and Rülke 2011) and are, hence, suitable to estimate the governments' loss function. Results based on other set of instruments, including, for example, the real growth rate and the money market rate are qualitatively similar and available upon request.

Testing whether  $\hat{\alpha}$  differs from  $\alpha_0$  is done by using the z-test  $\sqrt{T}(\hat{\alpha} - \alpha_0) \rightarrow \mathcal{N}(0, (\hat{h}'\hat{S}^{-1}\hat{h})^{-1})$ , where  $\hat{h} = \frac{1}{T} \sum_{t=\tau}^{T+\tau-1} v_t |s_{t+1} - f_{t+1}|^{p-1}$ . Elliott et al. (2005) further prove that testing for rationality of forecasts, conditional on a loss function of the lin-lin or quad-quad type, can be achieved by computing

$$J(\hat{\alpha}) = \frac{1}{T} (x_t' \hat{S}^{-1} x_t) \sim \chi_{d-1}^2, \quad (6)$$

where  $x_t = \sum_{t=\tau}^{T+\tau-1} v_t [I(s_{t+1} - f_{t+1} < 0) - \hat{\alpha}] |s_{t+1} - f_{t+1}|^{p-1}$  and  $d$  denotes the number of instruments. For a symmetric (lin-lin or quad-quad) loss function, we have  $J(0.5) \sim \chi_d^2$ . The statistic  $J(0.5)$  answers the question of whether a forecaster under the maintained assumption of a symmetric loss function forms rational forecasts. For an estimated (that is, unconstrained) lin-lin or quad-quad loss function, the test,  $J(\hat{\alpha})$ , answers the question of whether forecasters form rational forecasts, given the estimate of the shape of the asymmetric loss function.

### 3 Data

We use forecasts of the budget balance in percent of GDP published by official government agencies and compiled and provided by Frankel (2012) and De Castro et al. (2013). Our data set covers 15 European countries, namely Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the United Kingdom. While the sample period ends consistently for all countries in 2010, the start of the sample period differs. For example, the government



of Italy publishes fiscal balance forecasts since 1985, while for Spain the forecasts are available since 1997. Forecasts are made for the current year, one-year ahead, and two-years-ahead where we have in total 482, 275 and 265 forecasts available. To calculate the forecast error of the budget-balance forecast, we supplemented the forecasts with the actual values obtained from the EC Ameco database. Notice that a fiscal deficit is defined as a negative value so that from an economic perspective an underprojection of the fiscal balance reflects that the fiscal situation turns out to be better than projected.

Insert Figure 1 about here.

Figure 1 shows the actual values of the fiscal balance (solid line) as well as the forecasts (dotted line). Two observations stand out. First, for most countries the forecasts are more optimistic than the realized values. For Greece, for example, the forecast always exceeds the realized value of the fiscal balance except for the two-years-ahead forecast made in 2004. Second, the introduction of a fiscal rule does not necessarily change the optimistic bias in forecasts. For example, for Italy and Germany, which have introduced a fiscal rule, namely the Stability and Growth Pact, in 1992, the forecasts remain above the realized values in the years after the introduction.

## 4 Empirical Results

In this section we present our baseline results and report some robustness tests. Specifically, we analyze whether government ideology, parliamentary elections, and the implementation of a national fiscal rule have an impact on the perceived loss of government budget-balance forecast errors. Additionally, we compare budget-balance forecasts of governments with forecasts submitted by private-sector forecasters and analyze whether the forecast horizon changes the shape of governments' loss functions.

### 4.1 Baseline Results

Table 1 summarizes for each set of instrument the results for a lin-lin loss function ( $p = 1$ ) based on the current-year forecasts. The results labeled 'Pooled' are based on forecasts pooled across countries and show that the

asymmetry parameter ( $\hat{\alpha}$ ) assumes a value of about 0.46, which is statistically not different from 0.50. Governments, on average, seem to have a symmetric loss function. However, substantial differences with respect to the loss function emerge when one studies forecasts for individual countries. Based on the estimates of the asymmetry parameter for individual countries, we can form three groups of countries that exhibit asymmetry parameter which are significantly different from each other. The first group contains countries for which  $\hat{\alpha} < 0.5$ . This group contains Austria, Belgium, Denmark, Finland, Luxembourg, the Netherlands, and Sweden. Governments in these countries appear to perceive a higher loss when overestimating the fiscal balance. This indicates that these governments prefer to submit conservative budget balance forecasts. The second group contains countries for which the hypothesis  $\hat{\alpha} = 0.5$  cannot be rejected. The government agencies of France, Germany, Ireland, Portugal, Spain and the United Kingdom belong to this second group. Their forecasts appear to have a symmetric loss function, reflecting that these governments target the actual value rather than submitting a conservative or optimistic forecast. Finally, Greece and Italy form the third group of countries. For both countries, we find strong evidence of  $\hat{\alpha} > 0.5$ . Government agencies in Greece and Italy appear to perceive a higher loss when underpredicting the fiscal balance compared to an overprediction of similar size. Results based on the quad-quad loss function ( $p = 2$ ) are available upon request and are qualitatively similar.

Insert Table 1 about here.

When government agencies forecast under an asymmetric loss function, a forecast may look biased and irrational if a researcher applies a standard quadratic loss function to analyze the properties of forecasts. In order to study forecast rationality conditional on the loss function given in Equation (1), Table 1 reports the results of the  $J$ -tests for rational forecasts. Under an imposed symmetric loss function ( $\hat{\alpha} = 0.5$ ), the test results reject the hypothesis of rational forecasts in 9 (11) out of 15 cases on a ten percent level for models 2, 3 (and 4). Compared to that, testing for forecast rationality under an estimated asymmetric loss function, tends to remedy violations of forecast rationality observed under an imposed symmetric loss function. For model 2 (3), we can only reject rationality of governments budget balance forecasts in 3 (4) cases. Hence, under a symmetric loss function violations

of forecast rationality is the norm, while under an asymmetric loss function it is the exception. To sum up, a key finding is that our results show that the budget balance forecast bias in governmental forecasts (Frankel, 2012) can be rational when allowing for an asymmetric loss function.

Insert Table 2 about here.

To analyze whether the forecast horizon matters for the perceived loss of governments Table 2 reports the results based on the forecasts referring to the one-year-ahead forecasts. The results indicate that the parameter,  $\hat{\alpha}$ , tends to increase in the forecast horizon. For pooled forecasts the asymmetry parameter of about 0.60 is significantly larger than 0.5 indicating that governments appear to perceive a higher loss when underestimating the budget balance compared to an overestimation of similar size. This is also true on a individual country level. For example, the parameter,  $\hat{\alpha}$  (Model 1), based on the current-year fiscal balance forecasts ( $h = 1$ ) is about 0.29 for Austria. For the one-year-ahead forecast horizon ( $h = 2$ ), the parameter,  $\hat{\alpha}$ , is of about 0.67. In other words, government agencies tend to become less concerned about a too optimistic forecast when the forecast horizon increases. This effect is even stronger when looking at the results based on the two-years-ahead forecasts which are available upon request. For example, based on the two-years-ahead fiscal balance forecasts ( $h = 3$ ) the asymmetry parameter for Austria is 0.72. Thus, governments forecasting the budget balance to be too low relative to the realization experience a larger loss relative to forecasting the budget balance to be too high. Again, interesting cross-country differences emerge. While some governments exhibit a symmetric loss function, other governments, like Belgium, France, Greece and Spain show an asymmetric loss function.

Insert Table 3 about here.

## 4.2 Government Ideology

Next, we analyze whether the shape of the loss function is influenced by distinct factors related to political-economy factors. One such factor could be the ideology of the incumbent government. Ideological considerations may affect the government's willingness to accept excessive budget deficits. For example, Potrafke (2009) reports that left-wing governments increased

social expenditures and pursued expansionary policies especially in the 1980ies. Government ideology, thus, may have an impact on the government's perceived loss of over- and underprojections of budget balances. To evaluate whether ideology matters, we use the indicator of government ideology developed by Potrafke (2009), who classifies governments in OECD countries on a right-wing, centered, and left-wing scale. Our data set is quite balanced since we have available 164 (196) observations for right-wing (left-wing) governments and 122 observations for centered governments. Also, changes in government ideology took place quite often. Across all 15 countries, in total 29 changes in government ideology occurred during our sample period which guaranties that our results are not driven by country-specific factors.

Table 3 reports the results based on the lin-lin loss function. The results indicate that right-wing and left-wing governments have an asymmetry parameter not different from each other and not different from 0.50. This indicates that their loss-function is symmetric and supports the results based on the pooled data set. Compared to this, centered governments exhibit an asymmetry parameter of about 0.36 indicating that a loss of an overestimation is higher than of an underestimation of the budget balance. Put differently, centered governments make optimistic budget balance forecasts and perceive relative to left- and right-wing governments a lower loss when their optimistic forecasts does not turn out to be correct. A possible explanation is that centered governments might think that political credibility is not at stake when making optimistic forecasts. Based on the one-year-ahead forecasts Table 3 further shows that the asymmetry parameter is again increasing in the forecast horizon. Interestingly, for right-wing governments ( $\hat{\alpha}$  of about 0.68) the results indicate that an underestimation of the budget balance seems to be more harmful indicating that right-wing governments make conservative longer-term forecasts. The *J*-test indicates that governments' forecasts do not look more rational under asymmetric loss compared to a symmetric loss function.

### 4.3 Parliamentary Elections

As another robustness test, we analyze whether the shape of the loss function changes before of a parliamentary election. Merola and Perez (2012) show that fiscal forecasts published by the OECD and the EC exhibit a bias correlated with electoral cycles in EU countries over the period 1999-2007. Strauch et al. (2004) discuss two reasons why incumbent governments may want to issue biased forecasts in electoral years. First, incumbent governments may try to draw a picture of a “healthy” economy and fiscal discipline. In other words governments may change their perception of forecast errors towards optimistic forecasts in election years since elections create strong incentives for incumbent governments to design economic policies so as to maximize their chances to stay in power (Jonung and Larch 2006). This in turn, may yield the positive forecast bias in governments budget balance forecasts as reported in Frankel (2012). Second, they may seek to boost the economy with a fiscal expansion before elections in order to improve their reelection chances. To study the shape of governments’ loss function in election years, we identify the years in which a parliamentary election took place.<sup>2</sup> We expect that in election years the asymmetry parameter in the governments’ loss function is larger as compared to times of no election. Such a tilt in a government’s loss function would indicate that a lower fiscal balance at the end of the election year is perceived as not so harmful. An election took place in 130 cases out of 482 observations.

Table 3 reports the results. The results show that the asymmetry parameter in years of elections is, indeed, larger than in years without election. While for current-year forecasts the government’s loss function tends to be symmetric ( $\hat{\alpha}$  of about 0.50) in years without elections, the estimate  $\hat{\alpha}$  is smaller than 0.50. For one-year-ahead forecasts, the asymmetry parameter is even significantly larger than 0.50 in years of elections. This indicates that governments in years of elections publish too optimistic forecasts and give a lower weight to overprojections of the fiscal balance as compared to years without parliamentary elections. Put differently, governments are

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<sup>2</sup>Parliamentary election are recorded by the International Institute for Democracy and Electoral Assistance (<http://www.idea.int/vt/parl.cfm>) and are combined with the information from the website <http://electionresources.org>. For further information, see Poplawski-Ribeiro (2009).

less concerned to announce higher budget deficits than expected after an election.

#### 4.4 Implementation of Fiscal Rules

As yet another robustness test, we study whether the government's perception of forecast errors changes once a fiscal rule is implemented. One reason might be that fiscal rules are often designed to evaluate governments on grounds of their budget balance forecasts. For example, EU countries which fail to comply to the Stability and Growth Pact take the risk to be subject to a excessive deficit procedure (Strauch et al. 2004). Hence, the implementation of a fiscal rule might affect the shape of the governments' loss function. Note that we can not analyze the impact of a supranational fiscal rule such as the Stability and Growth Pact since all countries in our sample have signed this fiscal rule. This, however, has the advantage that each and every country under consideration experience similar supranational conditions and only differs with respect to the implementation of a national fiscal rules.

We study the impact of the implementation of a fiscal rule by identifying and pooling the data for the countries that have (not) imposed a national budget balance rule. Recently, the IMF and the EC compiled data on fiscal rules (IMF 2009, EC 2009, Schaechter et al. 2012). We use these databases to determine when national budget balance rule came into force. Notice that we do not take expenditure, revenues or debt rules into account since these might only indirectly affect budget balance forecasts. While some countries (date of introduction), like Austria (1995), Denmark (1992) and Germany (1969) have adopted a national budget balance rule prior to our sample period, some countries, like Finland (1999), Sweden (2000), and the United Kingdom (1997) introduced a national fiscal rule during our sample period, which makes it possible to trace back the effect of the implementation of a fiscal rule on the governments' loss function.

Results summarized in Table 3 show that the estimated asymmetry parameter for current-year forecasts is lower for the group of countries that have imposed a fiscal rule. This result suggests that implementing a fiscal rule helps to make governments aware of the positive forecast bias. The  $\hat{\alpha}$ -difference between countries with a fiscal rule and countries without a fis-

cal rule gets smaller for one-year-ahead-year forecasts. Because  $\hat{\alpha}$  increases in the forecast horizon, it must be the case that this effect is stronger for countries without a fiscal rule, narrowing the wedge between the countries with and without a fiscal rule.

Insert Figure 2 about here.

In order to illustrate our results, Figure 2 plots the estimated loss functions for each robustness test, namely ideology, election, implementation of a fiscal rule, and different forecast horizons. While Panel A refers to the lin-lin loss function ( $p = 1$ ), Panel B reports the results based on the quad-quad function ( $p = 2$ ). All specifications are based on on Model 1 and current-year forecasts except for the right column which depicts all forecast horizons. Results based on Models 2-4 are qualitatively similar and available upon request. The first column (Ideology) displays the loss functions for the three measures of ideology. It shows that the loss functions of right-wing and left-wing governments do not differ which is supported by Panel B (quad-quad loss function). The second column (Election) refers to the loss function in years with and without parliamentary elections. Although the differences appears to be small, in years of an election the government tends to be to optimistic and the loss given to a budget balance forecast which turns out to be too low is lower compared to years without a parliamentary election. Put differently, it shows that in times of elections, the weight attached to negative forecast errors is (significantly) lower as compared to years without a parliamentary election.

The third column (Fiscal Rule) shows the loss function with and without a national budget balance rule. While without a fiscal rule the loss function is symmetric, under a fiscal rule governments are more concerned to overestimate the fiscal balance. Thus, forecasts of government agencies in countries where a fiscal rule is in place do not exhibit a positive forecast bias. A comparison of the loss function shows that government agencies' apparently become more averse to underpredicting the fiscal balance as the forecast horizon increases and when a fiscal rule is in place. The fourth column (Forecast Horizon) reports the pooled results for all three forecast horizons ( $h = 1, 2, 3$ ), namely current-year (black line), one-year-ahead (grey line) and two-years-ahead (dotted line). The results show that the forecast

horizon matters for the shape the government's loss function. The longer the forecast horizon the higher the asymmetry parameter indicating that governments perceive a higher loss when underestimating the fiscal balance for longer-term forecasts. This result is reasonable since a government might be punished quickly when it has underestimated the fiscal balance. This, in turn, indicates that governments have an incentive to project a better fiscal situation (higher fiscal balance) for the long-term since they are aware that they might not be punished compared to an underprojection of the current-year development.

#### 4.5 Private-Sector Forecasts

As an additional exercise, we compare the governments' loss function with the loss function based on private-sector forecasts. To this end, we use the Consensus Economics Forecast poll, which comprises data from questionnaire surveys among private-sector forecasters.<sup>3</sup> Since May 1993, Consensus Economics publishes on a monthly basis the mean of the private-sector current-year and one-year-ahead forecasts concerning fiscal balance forecasts for the G7 countries. The forecasts are, hence, comparable to those forecasts published by the government. In order to ensure the comparability of the two data sets, we restrict our analysis to the same sample period 1993 to 2010 which leaves us with 211 monthly observations for each country.

Insert Table 4 about here.

Table 4 summarizes the results, where the set of instruments (Model 1 and 2) is the same as the one we use to study the government forecasts. Compared to the governments loss function, the degree of heterogeneity is lower across the countries. The asymmetry parameter ranges between 0.15 (Canada) and 0.59 (France). The pooled coefficient of 0.40 indicates that private-sector forecasters perceive a higher loss when overestimating the fiscal balance compared to an underestimation of similar size. The results for France, Italy, and the United Kingdom show that the point estimates of the asymmetry parameter,  $\hat{\alpha}$ , are consistent with a symmetric loss function, which corroborates the results based on the government

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<sup>3</sup>A detailed documentation is available at <http://www.consensuseconomics.com>.



forecasts. Compared to that, the results for Canada, Germany, and the United States show an asymmetry parameter smaller than 0.50 indicating that private-sector forecasters experience a higher loss when overprojecting the fiscal balance compared to an underprojection. This result indicates that the private-sector forecasters, as compared to governments, either target a symmetric loss function or they submit conservative forecasts. One reason might be that forecasters perceive that the private sector profits from government investments. Hence, a positive surprise of the fiscal situation is more acknowledged and less harmful as compared to negative surprises. This result is supported by the findings based on the one-year-ahead forecasts. Compared to government forecasts, the shape of the loss function does not change with respect to the forecast horizon.

Interestingly, the rationality condition can be rejected under a symmetric loss function for all countries based on private-sector forecasts. Compared to that, a flexible loss function makes the private-sector forecasts look rational for Germany and the United Kingdom in the case of current-year forecasts as well as for Canada and the United States in the case of the one-year-ahead forecasts. This also applies for the pooled one-year-ahead forecasts where the rationality condition can be rejected under symmetric loss while not under asymmetric loss. In this respect, the private-sector forecasts resemble the governmental forecasts as a flexible loss function indicates forecast rationality.

Insert Figure 3 about here.

Figure 3 illustrates the lin-lin loss function for the private-sector (black line) and the government (grey line) for France, Germany, Italy, and the United Kingdom, which are the four countries for which we have data for both groups. While for France both loss functions look similar, other government agencies perceive a higher loss when overpredicting the fiscal balance as compared to the private-sector. The private-sector perceives, as compared to the government, a higher loss when underpredicting the fiscal balance. Private-sector forecasters, thus, seem to behave conservative in the sense that a negative fiscal surprise is more harmful than a positive surprise.

## 5 Concluding remarks

We have used fiscal balance forecasts published by 15 European economies to uncover the loss function of governments. The results clearly suggest that the shape of governments' loss functions differs across European countries. We have identified three groups of countries. The first group consists of the Benelux and northern European countries, which incur a higher loss when overpredicting the fiscal balance compared to an underprediction of the same size. The second group comprises inter alia France and Germany, whose government agencies' seem to have a symmetric loss function. The third group of countries comprises Greece and Italy, which incur a higher loss when underpredicting the fiscal balance. We also have reported how a fiscal rule, years of parliamentary elections, and a longer forecast horizon affect the asymmetry of the loss function. Under a fiscal rule government agencies experience a higher loss when overpredicting the fiscal balance indicating that the implementation of a fiscal rule helps to promote fiscal sustainability. Finally, an asymmetric loss function helps, as far as current-year forecasts are concerned, in many cases to reconcile forecasts with the rationality hypothesis.

We have also compared the governments' loss functions with the loss functions based on private-sector forecasts. While for France and the United Kingdom the degree of asymmetry is comparable among government and private-sector forecasts, the private-sector forecasters in general seem to be more concerned when they expect a better fiscal situation compared to the eventually realized situation. Our results, thus, suggest that government forecasts are indeed different from the private-sector forecasts.

We have also found that estimating an asymmetric loss function tends to favor budget balance forecasts towards rationality but does not always make forecasts look rational. Yet, rejecting forecast rationality does not necessarily imply that government agencies, in fact, publish irrational forecasts. Our results merely demonstrate that, conditional on a specific functional form of the government agencies' loss function, forecasts in some cases remain biased. This leaves two possibilities. One possibility is that government agencies indeed deliver forecasts that are not consistent with forecast ratio-

nality. Another possibility, though, is that the loss function is more general than assumed under the null hypothesis of the  $J$ -test. It is interesting to broaden in future research the class of admissible loss functions, probably taking into account explicitly strategic motives of government agencies and potential nonlinearities in the economic structure that do not arise because of an asymmetric loss function.

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Table 1: Asymmetry parameter (lin-lin), current-year forecasts

Country	$\hat{\alpha}_1$	$\hat{\alpha}_2$	$\hat{\alpha}_3$	$\hat{\alpha}_4$	$J_2(0.5)$	$J_3(0.5)$	$J_4(0.5)$	$J_2(\hat{\alpha})$	$J_3(\hat{\alpha})$	$J_4(\hat{\alpha})$
Austria $n = 31$	.290* (.08)	.290* (.08)	.287* (.08)	.274* (.08)	5.48 [.06]	5.61 [.06]	6.25 [.04]	0.03 [.86]	0.22 [.64]	1.16 [.28]
Belgium $n = 31$	.258* (.08)	.256* (.08)	.215* (.07)	.211* (.07)	7.33 [.03]	10.09 [.01]	10.50 [.01]	0.13 [.72]	2.70 [.10]	2.94 [.09]
Denmark $n = 31$	.355 (.09)	.328* (.08)	.341* (.09)	.341* (.09)	4.73 [.09]	3.60 [.17]	3.60 [.17]	2.54 [.11]	1.35 [.25]	1.35 [.24]
Finland $n = 31$	.290* (.08)	.223* (.07)	.290* (.08)	.264* (.08)	10.59 [.01]	5.48 [.06]	7.39 [.02]	4.58 [.03]	0.05 [.82]	1.81 [.18]
France $n = 30$	.600 (.09)	.602 (.09)	.625 (.09)	.629 (.09)	1.43 [.49]	4.62 [.10]	4.99 [.08]	0.30 [.58]	3.12 [.08]	3.44 [.06]
Germany $n = 37$	.568 (.08)	.578 (.08)	.576 (.08)	.597 (.08)	2.93 [.23]	2.46 [.29]	5.26 [.07]	2.46 [.12]	2.12 [.15]	5.79 [.02]
Greece $n = 28$	.857* (.07)	.863* (.07)	.879* (.06)	.879* (.06)	14.36 [.00]	14.61 [.00]	14.96 [.00]	0.22 [.64]	0.95 [.33]	0.95 [.33]
Ireland $n = 31$	.419 (.09)	.417 (.09)	.417 (.09)	.406 (.09)	1.40 [.50]	1.28 [.53]	3.45 [.18]	0.46 [.50]	0.40 [.52]	2.16 [.14]
Italy $n = 43$	.698* (.07)	.734* (.07)	.714* (.07)	.730* (.07)	8.23 [.02]	7.51 [.02]	8.76 [.01]	3.59 [.06]	1.70 [.19]	3.27 [.07]
Luxembourg $n = 31$	.194* (.07)	.189* (.07)	.147* (.06)	.134* (.06)	11.83 [.00]	13.40 [.00]	13.89 [.00]	0.24 [.62]	2.57 [.11]	3.45 [.06]
Netherlands $n = 35$	.400 (.08)	.397 (.08)	.355* (.08)	.305* (.08)	2.02 [.36]	9.54 [.01]	13.36 [.00]	0.46 [.50]	5.73 [.02]	10.04 [.00]
Portugal $n = 31$	.613 (.09)	.625 (.09)	.616 (.09)	.628 (.09)	2.86 [.24]	1.89 [.39]	3.55 [.17]	1.47 [.23]	0.41 [.52]	1.85 [.17]
Spain $n = 31$	.419 (.09)	.411 (.09)	.415 (.09)	.405 (.09)	2.50 [.29]	1.64 [.44]	2.82 [.24]	1.42 [.23]	0.72 [.40]	2.34 [.13]
Sweden $n = 32$	.344 (.08)	.314* (.08)	.290* (.08)	.281* (.08)	6.23 [.04]	8.27 [.02]	8.32 [.02]	2.72 [.10]	4.57 [.03]	5.24 [.02]
UK $n = 29$	.552 (.09)	.607 (.09)	.582 (.09)	.614 (.09)	6.56 [.04]	4.99 [.08]	8.34 [.02]	7.85 [.01]	5.49 [.02]	8.40 [.00]
Pooled $n = 482$	.461 (.02)	.452 (.02)	.459 (.02)	.457 (.02)	46.86 [.00]	15.36 [.00]	22.37 [.00]	41.42 [.00]	11.90 [.00]	18.18 [.00]

Note: This table reports the estimates of the asymmetry parameter  $\hat{\alpha}$  for the current-year forecasts based on GMM. As instruments we consider a constant (Model 1), a constant and the lagged actual value (Model 2), a constant and the lagged inflation rate (Model 3), and a constant, the lagged inflation rate and the lagged treasury bill rate (Model 4).  $J(0.5)$  denotes the  $J$ -test for a symmetric loss function.  $J(\hat{\alpha})$  denotes the  $J$ -test for a estimated (unconstrained) lin-lin loss function. The  $J$ -test cannot be computed for Model 1 because only a constant is used as an instrument. \* = significantly different estimate from 0.5 (symmetric loss function) on a one percent level.  $n$  = number of observations.

Table 2: Asymmetry parameter (lin-lin), one-year-ahead forecasts

Country	$\hat{\alpha}_1$	$\hat{\alpha}_2$	$\hat{\alpha}_3$	$\hat{\alpha}_4$	$J_2(0.5)$	$J_3(0.5)$	$J_4(0.5)$	$J_2(\hat{\alpha})$	$J_3(\hat{\alpha})$	$J_4(\hat{\alpha})$
Austria $n = 18$	.667 (.11)	.705* (.11)	.735* (.10)	.745* (.10)	2.83 [.24]	4.77 [.09]	5.03 [.08]	1.81 [.18]	3.03 [.08]	3.47 [.06]
Belgium $n = 18$	.722* (.11)	.723* (.11)	.977* (.04)	.987* (.03)	3.58 [.17]	5.10 [.08]	5.57 [.06]	0.04 [.83]	56.06 [.00]	109.9 [.00]
Denmark $n = 18$	.611 (.11)	.770 (.10)	.632 (.11)	.638 (.11)	6.90 [.03]	2.30 [.32]	2.57 [.28]	7.86 [.01]	1.46 [.23]	1.79 [.18]
Finland $n = 18$	.389 (.11)	.365 (.11)	.325 (.11)	.305 (.11)	2.57 [.28]	3.30 [.19]	3.66 [.16]	1.62 [.20]	3.61 [.06]	4.46 [.03]
France $n = 19$	.790* (.09)	.798* (.01)	.797* (.09)	.987* (.03)	9.02 [.01]	6.41 [.04]	13.68 [.00]	8.82 [.00]	0.26 [.61]	62.89 [.00]
Germany $n = 19$	.474 (.11)	.465 (.11)	.473 (.11)	.468 (.11)	2.58 [.28]	0.28 [.87]	1.68 [.43]	2.46 [.12]	0.24 [.62]	1.64 [.20]
Greece $n = 17$	.706 (.11)	.720* (.11)	.713* (.11)	.731* (.11)	3.18 [.20]	3.00 [.22]	3.40 [.18]	0.57 [.45]	0.27 [.60]	0.97 [.32]
Ireland $n = 18$	.556 (.12)	.583 (.12)	.570 (.12)	.579 (.12)	2.56 [.28]	1.80 [.41]	2.31 [.32]	3.02 [.08]	1.85 [.17]	2.74 [.10]
Italy $n = 19$	.632 (.11)	.643 (.11)	.634 (.11)	.652 (.11)	1.86 [.39]	1.43 [.49]	2.45 [.29]	0.76 [.38]	0.17 [.68]	1.31 [.25]
Luxembourg $n = 18$	.444 (.12)	.434 (.12)	.429 (.12)	.404 (.12)	1.62 [.45]	2.41 [.30]	3.76 [.15]	1.43 [.23]	1.97 [.16]	3.91 [.05]
Netherlands $n = 19$	.526 (.11)	.699* (.11)	.538 (.11)	.542 (.11)	7.61 [.02]	3.21 [.20]	3.82 [.15]	10.92 [.00]	2.98 [.08]	3.57 [.06]
Portugal $n = 18$	.611 (.11)	.625 (.11)	.630 (.11)	.635 (.11)	1.52 [.47]	1.88 [.39]	2.22 [.33]	1.03 [.31]	1.35 [.25]	1.65 [.20]
Spain $n = 18$	.667 (.11)	.719* (.11)	.850* (.08)	.856* (.08)	3.07 [.22]	3.69 [.16]	3.71 [.16]	2.40 [.12]	9.48 [.00]	9.97 [.00]
Sweden $n = 19$	.579 (.11)	.612 (.11)	.579 (.11)	.586 (.11)	2.60 [.27]	0.49 [.78]	1.28 [.53]	2.87 [.09]	0.02 [.88]	0.76 [.38]
UK $n = 19$	.579 (.11)	.647 (.11)	.744 (.10)	.759 (.10)	4.03 [.13]	5.36 [.07]	7.30 [.03]	4.76 [.03]	9.15 [.00]	9.99 [.00]
Pooled $n = 275$	.596* (.03)	.618* (.03)	.601* (.03)	.609* (.03)	34.27 [.00]	16.26 [.00]	25.82 [.00]	25.39 [.00]	6.41 [.01]	15.39 [.00]

Note: This table reports the estimates of the asymmetry parameter  $\hat{\alpha}$  for the one-year-ahead forecasts based on GMM. As instruments we consider a constant (Model 1), a constant and the lagged actual value (Model 2), a constant and the lagged inflation rate (Model 3), and a constant, the lagged inflation rate and the lagged treasury bill rate (Model 4).  $J(0.5)$  denotes the  $J$ -test for a symmetric loss function.  $J(\hat{\alpha})$  denotes the  $J$ -test for a estimated (unconstrained) lin-lin loss function. The  $J$ -test cannot be computed for Model 1 because only a constant is used as an instrument. \* = significantly different estimate from 0.5 (symmetric loss function) on a one percent level.  $n$  = number of observations.



Table 3: Robustness Tests: Ideology, Election and Fiscal Rule

Horizon	Specification	$\hat{\alpha}_1$	$\hat{\alpha}_2$	$\hat{\alpha}_3$	$\hat{\alpha}_4$	$J_2(0.5)$	$J_3(0.5)$	$J_4(0.5)$	$J_2(\hat{\alpha})$	$J_3(\hat{\alpha})$	$J_4(\hat{\alpha})$
current-year	right-wing $n = 164$	.531 (.04)	.538 (.04)	.531 (.04)	.531 (.04)	15.81 [.00]	1.02 [.60]	1.10 [.58]	15.51 [.00]	0.41 [.52]	0.50 [.48]
	centered $n = 122$	.361* (.04)	.326* (.04)	.360* (.04)	.333* (.04)	26.89 [.00]	10.01 [.01]	23.97 [.00]	12.23 [.00]	0.41 [.52]	10.15 [.00]
	left-wing $n = 196$	.464 (.04)	.461 (.04)	.458 (.04)	.457 (.04)	9.34 [.01]	16.34 [.00]	18.13 [.00]	7.96 [.00]	14.99 [.00]	16.54 [.00]
	right-wing $n = 98$	.674* (.05)	.712* (.05)	.687* (.05)	.701* (.05)	20.65 [.00]	14.79 [.00]	18.60 [.00]	8.81 [.00]	3.42 [.06]	6.66 [.01]
one-year ahead	centered $n = 66$	.546 (.06)	.565 (.06)	.564 (.06)	.565 (.06)	9.80 [.01]	9.57 [.01]	9.64 [.01]	9.89 [.00]	9.71 [.00]	9.74 [.00]
	left-wing $n = 111$	.559 (.05)	.567 (.05)	.559 (.05)	.565 (.05)	7.79 [.02]	2.06 [.36]	7.27 [.03]	6.82 [.01]	0.54 [.46]	5.59 [.02]
	election $n = 130$	.492 (.04)	.489 (.04)	.491 (.04)	.491 (.04)	19.12 [.00]	9.86 [.01]	10.57 [.01]	18.74 [.00]	9.77 [.00]	10.42 [.00]
current-year	no election $n = 352$	.449* (.03)	.441* (.03)	.447* (.03)	.446* (.03)	29.40 [.00]	9.38 [.01]	15.06 [.00]	24.23 [.00]	5.40 [.02]	10.53 [.00]
	election $n = 72$	.694* (.05)	.735* (.05)	.695* (.05)	.720* (.05)	15.67 [.00]	10.89 [.00]	14.67 [.00]	6.19 [.01]	0.00 [.96]	4.16 [.04]
one-year ahead	no election $n = 203$	.562 (.03)	.576* (.03)	.567 (.03)	.571* (.03)	21.49 [.00]	10.58 [.01]	17.08 [.00]	18.76 [.00]	7.65 [.01]	13.75 [.00]
	with rule $n = 133$	.403* (.04)	.388* (.04)	.398* (.04)	.397* (.04)	19.26 [.00]	12.00 [.00]	12.44 [.00]	12.11 [.00]	5.15 [.02]	5.39 [.02]
current-year	without rule $n = 349$	.495 (.03)	.494 (.03)	.495 (.03)	.495 (.03)	27.85 [.00]	5.30 [.07]	11.59 [.00]	27.57 [.00]	5.24 [.02]	11.45 [.00]
	with rule $n = 109$	.551 (.05)	.563 (.05)	.551 (.05)	.555 (.05)	11.39 [.00]	1.83 [.40]	5.73 [.06]	10.51 [.00]	0.72 [.40]	4.58 [.03]
one-year ahead	without rule $n = 166$	.627* (.04)	.651* (.04)	.646* (.04)	.655* (.04)	23.01 [.00]	20.10 [.00]	25.11 [.00]	13.55 [.00]	11.28 [.00]	15.26 [.00]

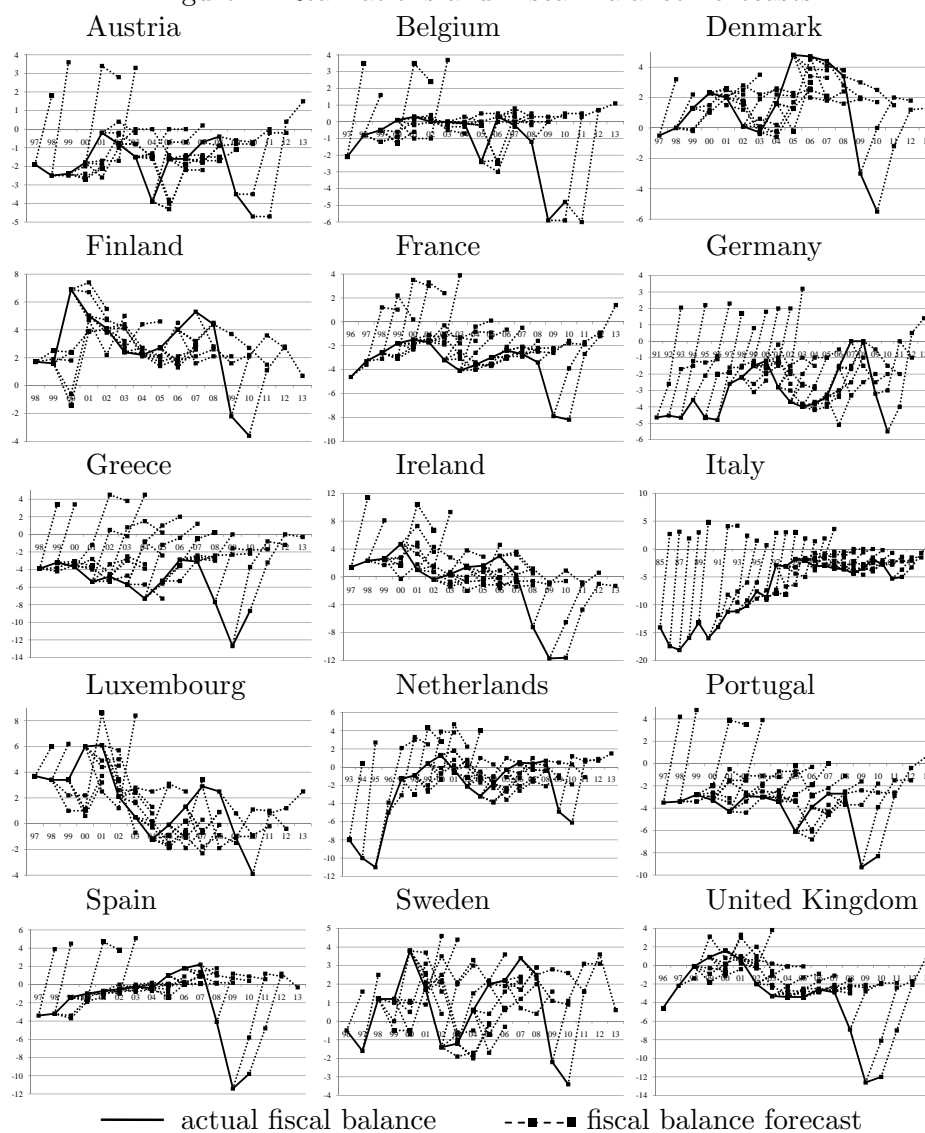
Note: This table reports the asymmetry parameter for different sub-samples, namely ideology, election and fiscal rule. For ideology, the governments are separated according to Potrafke (2009), parliament elections are identified according to Poplawski-Ribeiro (2009), and the date of the implementation of a fiscal rule is drawn from EC (2009) and Schaechter et al. (2012). As instruments we consider a constant (Model 1), a constant and the lagged actual value (Model 2), a constant and the lagged inflation rate (Model 3), and a constant, the lagged inflation rate and the lagged treasury bill rate (Model 4).  $J(0.5)$  denotes the  $J$ -test for a symmetric loss function.  $J(\hat{\alpha})$  denotes the  $J$ -test for an estimated (unconstrained) lin-lin loss function. The  $J$ -test cannot be computed for Model 1 because only a constant is used as an instrument. \* = significantly different estimate from 0.5 (symmetric loss function) on a one percent level.  $n$  = number of observations.

Table 4: Private-Sector Forecasts of G7 Countries

Country	Current-Year Forecasts				One-Year-Ahead Forecasts			
	$\hat{\alpha}_1$	$\hat{\alpha}_2$	$J_2(0.5)$	$J_2(\hat{\alpha})$	$\hat{\alpha}_1$	$\hat{\alpha}_2$	$J_2(0.5)$	$J_2(\hat{\alpha})$
Canada	.152*	.104*	115.3	12.6	.261*	.259*	49.2	0.95
$n = 211$	(.02)	(.02)	[.00]	[.00]	(.03)	(.03)	[.00]	[.33]
France	.592	.599	14.6	6.64	.289*	.233*	47.7	22.2
$n = 211$	(.03)	(.03)	[.00]	[.01]	(.03)	(.03)	[.00]	[.00]
Italy	.502	.503	26.2	26.2	.431	.409	69.9	67.5
$n = 211$	(.03)	(.03)	[.00]	[.00]	(.03)	(.03)	[.00]	[.00]
Japan	.441	.493	81.1	75.3	.498	.350*	111.7	103.8
$n = 211$	(.03)	(.03)	[.00]	[.00]	(.03)	(.03)	[.00]	[.00]
Germany	.374*	.372*	15.0	1.80	.327*	.314*	33.8	7.50
$n = 211$	(.03)	(.03)	[.00]	[.18]	(.03)	(.03)	[.00]	[.01]
United Kingdom	.422	.422	5.22	0.06	.559	.562	8.04	5.22
$n = 211$	(.03)	(.03)	[.07]	[.81]	(.03)	(.03)	[.02]	[.02]
United States	.318*	.274*	41.0	20.3	.379*	.380*	12.3	0.01
$n = 211$	(.03)	(.03)	[.00]	[.00]	(.03)	(.03)	[.00]	[.95]
Pooled	.400*	.397*	73.6	19.9	.392*	.391*	70.9	1.63
$n = 1.477$	(.01)	(.01)	[.00]	[.00]	(.01)	(.01)	[.00]	[.20]

Note: This table reports for the G7 countries the asymmetry parameter for budget balance forecasts submitted by private-sector forecasters provided by Consensus Economics. The time period spans May 1993 to December 2010. As instruments we consider a constant (Model 1), a constant and the lagged actual value (Model 2) for the current-year and one-year-ahead forecasts.  $J(0.5)$  denotes the  $J$ -test for a symmetric loss function.  $J(\hat{\alpha})$  denotes the  $J$ -test for a estimated (unconstrained) lin-lin function. The  $J$ -test cannot be computed for Model 1 because only a constant is used as an instrument. \* = significantly different estimate from 0.5 (symmetric loss function) on a one percent level.  $n$  = number of observations.

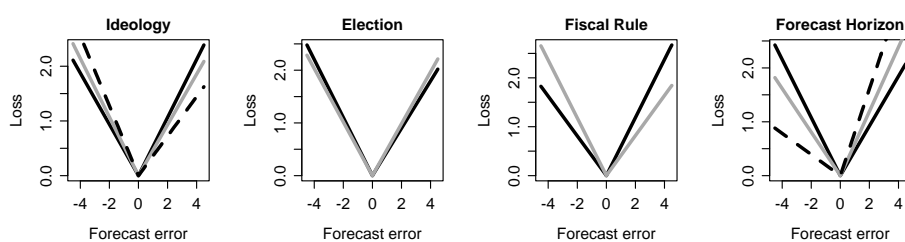
Figure 1: Realizations and Fiscal Balance Forecasts



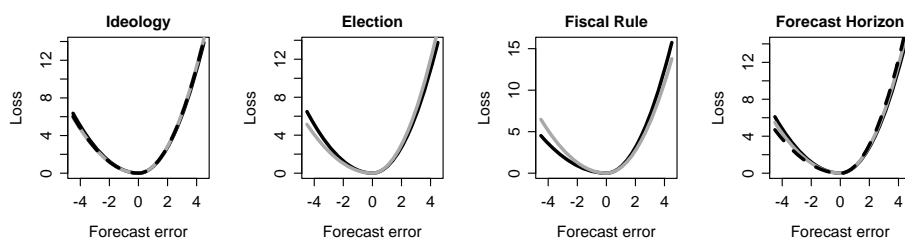
Note: This figure shows the current-year forecasts, one-year-ahead, and two-years-ahead fiscal balance forecasts in percent of GDP (dotted line) published by the official national government agencies. The solid line represents the actual value of the fiscal balance in percent of GDP obtained from the European Commission Ameco database.

Figure 2: Loss Function, Robustness Tests

Panel A: Linear Loss Function



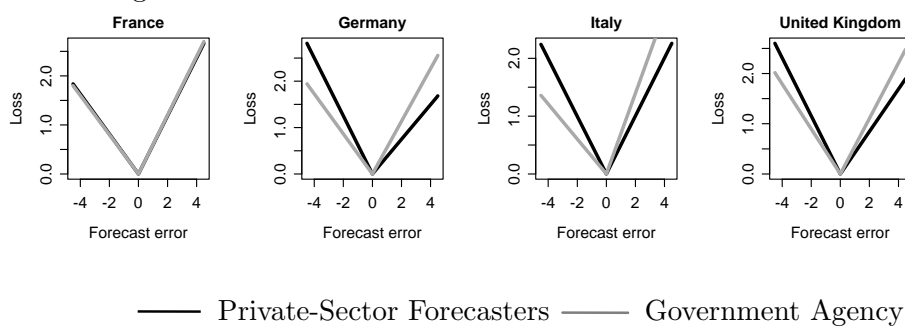
Panel B: Quadratic Loss Function



— right-wing    — no election    — without a fiscal rule    — current year  
 — left-wing    — election    — with a fiscal rule    — one-year ahead  
 - - - centered    - - - two-years ahead

Note: This figure shows the lin-lin (Panel A) and quad-quad (Panel B) loss function for government ideology, for years with and without a parliamentary election, in times with and without a fiscal rule and for three different forecast horizons ( $h = 1,2,3$ ). The results are based on the current-year forecasts and Model 1.

Figure 3: Private-Sector vs. Government Loss Function



Note: This figure shows the lin-lin loss function for those four countries in which forecasts by government agencies (grey line) and private-sector forecasters (black line) are available. The results are based on the current-year forecasts and Model 1.