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## **Evaluation and comparison of GDP growth and inflation forecasts for Portugal: national and international organizations**

Inês Alexandra Marques Moreira

Master in Economics

Supervisor:

PhD Luís Filipe Martins, Professor with Habilitation, ISCTE-IUL  
Business School, ISCTE-IUL - Instituto Universitário de Lisboa

October, 2022

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Department of Economics

Department of Political Economy

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*Ao meu Avô.*



## **Acknowledgments**

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## Resumo

A presente dissertação, numa primeira fase, avalia a qualidade de previsões, crescimento do PIB e inflação, realizadas para Portugal para o ano corrente, e para os 6 meses, 1 ano e 18 meses seguintes. São considerados dois períodos de análise: um período mais longo (2002-2021) que inclui as previsões do Banco de Portugal, Ministério das Finanças, Comissão Europeia, a Organização para a Cooperação e Desenvolvimento Económico e o Fundo Monetário Internacional e um período mais curto (2016-2021) que inclui, para além das referidas, o Conselho das Finanças Públicas. Para avaliar e comparar a qualidade das previsões são usadas estatísticas descritivas, como o erro de previsão médio, o erro de previsão absoluto médio e a raiz quadrada do erro de previsão. Adicionalmente são realizados testes de enviesamento e eficiência, que são dois requisitos de previsões ótimas. De forma a avaliar se os erros de previsão são significativamente diferentes entre as instituições, usa-se o teste de Diebold Mariano e uma versão modificada proposta posteriormente. Numa segunda fase, o objetivo passa por combinar as previsões e analisar se apresentam uma melhor qualidade comparativamente com as instituições. No período mais longo, os resultados sugerem que o Banco de Portugal é a instituição com melhor desempenho. Relativamente ao período mais curto, os resultados são mais inconsistentes devido ao pequeno número de observações. Maioritariamente, as previsões são não enviesadas e eficientes. Em relação à combinação de previsões, a média de todas as instituições demonstra ter um desempenho melhor que muitas das instituições individualmente

**Palavras-Chave:** Previsões; avaliação de previsões; combinação de previsões; Portugal.

**Códigos JEL:** C53, E37.





## Abstract

This dissertation focus, firstly, on evaluating the forecast accuracy of the macroeconomic variables, GDP growth and inflation, issued for Portugal for the current year, 6 months ahead, 1 year ahead and 18 months ahead. Regarding the period of the analysis, this paper studies a longer period (2002-2021), which includes forecasts from Central Bank of Portugal, Ministry of Finance, European Commission, Organization for Economic Cooperation and Development and International Monetary Fund and a shorter period (2016-2021), that also includes the Portuguese Public Finance Council. To evaluate and compare the accuracy of the forecasts, summary statistics are computed, namely the mean forecast error, the mean absolute forecast error and root mean squared forecast error. Moreover, tests for unbiasedness and efficiency are performed to assess whether the forecasts are optimal. By using the Diebold Mariano test and a modified version proposed later, the difference in accuracy between institutions is evaluated. Secondly, the goal is to combine the forecasts and analyze if the combined forecasts are better than the individual institutions' forecasts. The results suggest that, in general, the Central Bank of Portugal is the best institution, especially for the longer period. The results for the shorter period are more inconsistent, due to the small number of observations. In most cases, forecasts are unbiased and efficient. Regarding the combination of forecasts, the average of all institutions has a better performance than the majority of single institutions.

**Keywords:** Forecasts; forecast evaluation; combination of forecasts; Portugal.

**JEL codes:** C53, E37.



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# 1. Introduction

The International Institute of Forecasters (IIF), the first journal dedicated to forecasting issues, was founded in 1982. Since then, conferences that explore the aspects of forecasting were organized and “forecasting” became an institutionalized, permanent research subject of its own. (Heilemann & Stekler, 2007). Now more than ever, forecasts are a topic of many debates because they have an important role in policy decision-making and are of a great interest to economists, policymakers, and to general public.

International organizations, namely the European Commission (EC), Organization for Economic Cooperation and Development (OECD) and International Monetary Fund (IMF) have a practise of evaluate, with regularity, the forecasts issued to see if the accuracy has improved over time, and consequently to increase its transparency and credibility. In this sense, evaluate and compare forecasts is fundamental since they can lead to new ways of improving them (Graham & Timmermann, 2016).

The financial crisis of 2008 was also a game changer to “forecasting”. In the following years, papers were also focused on studying the accuracy of forecasts from the various institutions before and after the crisis. International organizations, in the consequence of the financial crisis, also started to increase the frequency of releasing their forecasts to offer additional information regarding uncertainty and risks (Tsuchiya, 2021).

More recently, the COVID-19 pandemic<sup>1</sup> showed how uncertain and unstable the economy is, with some institutions even delaying its publications to update its projections considering the new international environment. Nowadays, the inflation rate is on levels last seen decades ago, which was clearly not anticipated one year ago.

Different institutions issue different projections for the same variable, which can be due to various factors: the type of model used, the time of publication, the form and type of policies taken into account and the incorporation of elements of uncertainty (Portuguese Public Finance Council, 2016). The main goal of a forecaster is to take all the information available into consideration when producing a forecast (Chabin et al., 2020) and to have the minimum forecast error possible, which is the difference between the real value and the projection.

As suggested in the literature, the most common approach is analysing the forecasts issued, mainly, from international institutions for European countries and for the G7 economies. There

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<sup>1</sup> The World Health Organization (WHO) declared the COVID-19 as a global outbreak of pandemic on March 11, 2020, which was at first witnessed at the beginning of December 2019 in Wuhan City, China (Padhan & K. P. Prabheesh, 2021).

is also a lack of analysis regarding forecasts from both international organizations and other national institutions besides the government.

As, this Dissertation focus mainly of evaluating and comparing macroeconomic forecasts for Portugal issued from different institutions. The national institutions involved are the Central Bank of Portugal (BP), Portuguese Public Finance Council (CFP) and Ministry of Finance (MF), while the international organizations are the EC, OECD, and IMF. In this study, the variables under evaluation are the real Gross Domestic Product (GDP) growth and inflation rate, which are both important to economic analysis and policy debate.

Regarding the period of analysis and forecast horizons, this study focuses on a longer period, between 2002-2021 for the current year and 6 months ahead and between 2003-2021 for the 1 year ahead and 18 months ahead, and a shorter period, between 2016-2021 for the current year and 6 months ahead and between 2017-2021 for the 1 year ahead and 18 months ahead.

The main question that this study pretends to answer is the following: which institution is the best at forecasting each variable? To answer it, summary statistics used in this type of analysis are calculated, namely the mean forecast error, the mean absolute forecast error and the root mean square forecast error. In addition, a forecast is optimal if it is considered both unbiased and efficient, so this study also performs tests for unbiasedness and efficiency. The relative accuracy between the various institutions is also compared using the Diebold Mariano test and a modified version of it.

The main conclusions suggest that BP is considered the most accurate institution to forecast both GDP growth and inflation, especially for the longer period. About the shorter period, the results are more inconsistent due to the small number of observations. Considering both periods of analysis and comparing GDP growth and inflation forecasts, institutions make fewer mistakes when forecasting inflation, since the magnitude of the accuracy, measured by the MAE and RMSE, is smaller. The results also indicated that, in most cases, forecasts are unbiased and efficient, particularly for longer horizons. In terms of relative accuracy between institutions, no institution proved to be better than any other when predicting GDP growth and/or inflation.

Moreover, many studies suggest that combining forecasts can be a way of improving the accuracy of the forecasts and that no forecasting method or model performs at its best at all times (Fildes & Stekler, 2002). However, it is rare to see a comparison of different combined forecasts in the literature, but a comparison considering the Consensus Economics forecasts, which consist on the arithmetic average of various forecasts. To see if this holds true, in the

second part of the Dissertation, the aim is to see if combining forecasts in different ways result in a better forecast accuracy only considering the longer period of analysis.

In this matter, the results suggest that combining forecasts is indeed a way of improving the accuracy of the forecasts. The combination that consists on the simple arithmetic average of all institutions, the closest approach of Consensus Economics, turned out to have a better performance than the majority of single institutions.

This dissertation is structured as follows. Chapter 2 contains the literature review and a brief discussion of the gaps in the literature. Chapter 3 describes, in detail, the data and methodology. In this chapter, it is presented the institutions, the macroeconomics variables, the periods of analysis and the methods used to evaluate, compare and combine the forecasts. Chapter 4 discusses the empirical results. The last chapter summarizes the results and gives some suggestions for future research



## 2. Literature Review

In this chapter, the objective is to present an overview of the main literature with a great focus on organizations that provide forecasts, namely international organizations, private sector analysts as is the case of Consensus Economics, and national institutions. To conclude, a resume of the literature and its gaps is given.

### 2.1 Forecasts from different types of organizations

#### 2.1.1 International organizations

Many international organizations, such as the European Commission (EC), International Monetary Fund (IMF) and Organisation for Economic Cooperation and Development (OECD), provide macroeconomic projections for different countries and forecast horizons. These have been available to the public for a long period of time.

Consequently, some authors considered that an important task is to examine the accuracy of macroeconomics forecasts, which is related to forecast errors, the difference between the real outcome and the prediction (Heilemann & Stekler, 2007). However, not only accuracy is important to examine but also unbiasedness and efficiency. While the former is related to over or underpredicted outcomes, the latter is related to whether forecasts can be improved by a better use of available information (Celasun et al., 2021).

EC has a practice of frequently evaluate its forecasting performance to increase the transparency and credibility of its forecasts. It was first examined by Keereman in 1999, followed by Melander et al. in 2007, by González Cabanillas and Terzi in 2012 and by Fioramanti in 2016<sup>2</sup>. More recently, Chabin et al. (2020) evaluated the projections of three different variables – Gross Domestic Product (GDP) growth, inflation, and the general government budget balance – for the Member States from the period 2000-2017 for two forecast horizons - current year and 1 year ahead. Considering the previous assessments on this matter, results showed that, recently, accuracy has indeed improved. This was shown by using three different measures to evaluate accuracy: the mean error (ME), as the name implies, consists of averaging the forecast error, however it is not considered a good measure because it can lead to wrong interpretations, since it offsets the positive and negative errors; the mean average error (MAE), consists of the average absolute error, which indicates that negative errors cannot

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<sup>2</sup> See Keereman (1999), Melander et al. (2007), González Cabanillas & Terzi (2012) and Fioramanti et al. (2016).

cancel out positive ones, being a more assertive measure than the ME ; the root mean square error (RMSE), is the square root of the average of the squared forecast errors and indicates by “*how many units the forecasts differed from the outcome on average*” (Celasun et al., 2021:6).

Chabin et al. (2020), in its assessment, also compares the EC forecasts with other organizations’ forecasts, namely OECD and IMF. For the current year, EC forecasts were less accurate than OECD forecasts in the case of Spain, Italy, Finland and UK. On the other hand, for the 1 year ahead, for the Greece and Portugal, the forecasts from EC are more accurate but for Ireland, Luxembourg, Austria and the euro area are less accurate. By looking at the bigger picture, the performance of both institutions, EC and OECD, is nearly identical, particularly for the 1 year ahead horizon but OECD seems more accurate for the current year. Regarding the comparison with IMF, for the current year, EC forecasts are better for Greece and Ireland, but worse for Belgium, France, Italy, Luxembourg and the Netherlands. For 1 year ahead, the EC forecasts come out as more accurate than the IMF’s. The authors argued that the differences that occur may be due to the time of publication being different, since OECD publishes its forecasts later than EC and IMF earlier than EC.

IMF also occasionally examines its forecasts performance. The first assessment was made by Kenen and Schwartz in 1986, followed by Artis in 1988, by Barrionuevo in 1993, and in 1996 by Artis<sup>3</sup>. Then, Timmermann (2007) examined the World Economic Outlook (WEO), issued by IMF, and gathered some interesting findings. The analysis focused on GDP growth and inflation forecasts for the current-year and 1 year ahead from the period 1990-2003 for a high number of countries. Regarding the forecasts for GDP growth, the results showed that there was a tendency of overprediction, especially for the 1 year ahead while the opposite occurs in the case of inflation forecasts, with a visible tendency of underprediction. More recently, Celasun et al. (2021) evaluated the real GDP growth forecasts for many economies from the period 2004-2017 and for different horizon forecasts (current-year, one-to-five years ahead). Considering both assessments, the conclusions pointed out that short-term forecasts were more accurate in 2004-2017 than in 1990-2003 for more than half of the countries analysed, considering the RMSE. Regarding current-year and 1 year ahead forecasts, no significant upward or downward bias existed. In the other hand, longer horizons tend to have a positive bias.

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<sup>3</sup> See Kenen, P. B. & Schwartz, S. B. (1986), Artis (1988), Barrionuevo (1993) and Artis (1996).

Regarding OECD<sup>4</sup>, there are two analyses made more recently. One focused on evaluating GDP growth projections for the G7<sup>5</sup> economies from the period 1991-2006 for three different horizons – the projections in spring for the current-year, the projections in autumn and in spring for the 1 year ahead. In this paper, the main results indicated that, the current-year projections were unbiased and efficient, however for 1 year ahead projections an upward bias showed; the spring 1 year ahead projections, were less informative compared to autumn projections (Vogel, 2007). The other examined not only the performance of GDP growth but also inflation, during and after the financial crisis over the period 2007-2012, using the same three measures mentioned, ME, MAE, RMSE. As expected, the results showed an overestimation of growth forecasts, and at the peak of the financial crisis, in 2009, the errors were the largest. Inflation forecasts, in other hand, were underestimated (Pain et al., 2014).

Independent analysis also occurs considering international organizations' forecasts. Júlio & Esperança (2012), analysed the forecast quality, in this case, of GDP growth and its components - private consumption, government consumption, investment, exports, and imports – for G7 countries for 1 year ahead and same year predictions from OECD and IMF over the period 1993-2010. For 1 year ahead, GDP is general overestimated, due to lower forecast accuracy of investment, exports, and imports. For the current-year, GDP forecasts were considered the most accurate. Comparing OECD and IMF GDP growth forecasts, the results revealed that OECD forecasts have a higher accuracy than IMF forecasts, namely for France, Germany, Italy, and Japan at the 3-period span. However, in remaining horizons, the forecast accuracy is similar: OECD is better than IMF for some countries and worse in others.

According to the literature, no international organization is considered “the best” at forecasting for a specific country, variable or forecast horizon. As many authors suggest, the difference may be because organizations issued their forecasts in different occasions.

### **2.1.2 Private sector analysts**

However, forecasts are not only provided by these organizations. Forecasts from private sector analysts are an alternative, which is the case of Consensus Economics (CE) forecasts, the most referred along the literature. These forecasts are published monthly and are computed as the mean of individual responses to a monthly survey among professional forecasters (Ager et al.,

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<sup>4</sup> See Llewellyn & Arai (1984), Ballis (1989), Koutsogeorgopoulou (2000) for earlier analysis.

<sup>5</sup> France, United States, United Kingdom, Germany, Japan, Italy, and Canada by (European Commission, n.d.)

2009). The assessments mentioned before, from international organizations, include a comparison with Consensus Economics forecasts and, in general, in terms of accuracy, the forecasts turned out to be similar.

Other studies also used Consensus Economics in their research. Abreu (2011) evaluated the performance of economic growth and inflation forecasts for 9 advanced economies<sup>6</sup> over the period 1991-2009. The authors compared the forecasts issued by IMF, EC, and OECD and from two private analysts, the Consensus Economics and The Economist. For evaluating inflations forecasts, only IMF and the two surveys of private analysts were considered due to the lack of data. Accuracy, unbiasedness, and efficiency were all examined. For the various horizons, the quantitative accuracy of the GDP growth forecasts by international organizations were not statistically different from the forecasts released by Consensus Economics and The Economist. GDP growth forecasts, for the current year, are generally unbiased and efficient, while for 1 year ahead, forecasts show a significant downward bias for major euro area countries. For both horizons, the inflation predictions, were in most cases, unbiased and efficient. Regarding the quantitative accuracy of inflation forecasts, the conclusion is the same as before: the IMF's performance is similar to the Consensus and The Economist.

According to Batchelor (2001), which studied the economic forecasts for G7 countries for a short period of time, 1990-1996, concluded that forecasts from Consensus Economics forecasts are less biased and more accurate compared to international organizations, IMF and OECD, in terms of MAE and RMSE.

### **2.1.3 National institutions**

Until now, it was presented the main literature related to forecasts from international organizations and surveys from private sector analysts, as the Consensus Economics. Nevertheless, studies also evaluate the forecasts issued by governments or from an institute from a determined country, comparing with forecasts from other organizations.

A debate over which institution produce the most accurate forecasts and whether international organizations' forecasts are indeed better than governments' forecasts has been happening for a while.

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<sup>6</sup> Germany, France, Italy, Spain, Netherlands, Belgium, United Kingdom, United States, Japan.



Recently, Giovannelli & Pericoli (2020), assessed the accuracy real GDP growth forecasts of 13 European countries<sup>7</sup> for 1 year ahead and 2 years ahead horizons. This study evaluated governments and international organizations (EC, IMF, and OECD) for the period between 1999-2017. The authors argued that, considering literature review, governments' forecasts are over optimistic, while forecasts issued by international organizations are more efficient.

Including Portugal, Marinheiro (2011) analyses 15 European Union (EU) countries<sup>8</sup>, and compares the accuracy of growth and budget balance forecasts in years 1998-2008 from EC, IMF, and from the government of the corresponding country. Different forecasts horizons were analysed: current year, 1 year ahead, 2 years ahead, and 3 years ahead. The results showed that, in general, EC forecasts were “*a clear winner for all forecast horizons, except for the current period growth forecast*” (Marinheiro, 2011:14), according to the ME, MAE and RMSE.

Esperança et al. (2011) studied the forecast quality not only of the real GDP growth by also of its expenditure components for Portugal between 2002 and 2010. The authors used forecast data issued by international organizations – EC, IMF, OECD - and national institutions - Central Bank of Portugal (BP) and Portuguese Government Budget Office (GBO) and four different forecasts horizons: current-year, 6 months-ahead, 1 year ahead, 18 months ahead. The forecast quality was evaluated, first, through ME, MAE and RMSE. Additionally, the authors proposed two other measures: the Mean of Total Weighted Absolute Error (MTWAE), which evaluates the sum across components of the absolute distance between the forecast and the real outcome and the Mean of Total Weighted Squared Error (MTWSE), which evaluates the sum across components of the squared errors. The conclusions indicate that, at shorten horizons, GDP growth forecasts are in general accurate, however, at larger horizons, they tend to be more optimistic. At larger horizons, it was also possible to conclude that forecasts provided by BP are generally better than other institutions' predictions, which once again, can be related to the information available considering that BP's forecasts are issued later than the ones from other institutions. GBO forecasts, in other hand, seem to be the least accurate. The accuracy of the forecasts from EC, IMF and OECD displayed a similar pattern.

Recently, Gonçalves (2022) evaluated the performance forecasts from the Portuguese Public Finance Council (CFP), an independent body in Portugal, for the period between 2015-2019. The author used statistics to assess the quality of the forecasts and studied the

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<sup>7</sup> Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Spain, Sweden, United Kingdom.

<sup>8</sup> Belgium, Denmark, Germany, Greece, Spain, France, Ireland, Italy, Luxembourg, Netherlands, Austria, Portugal, Finland, Sweden, United Kingdom.

unbiasedness, serially uncorrelated errors, efficiency and non-increasing variance of errors as the projection horizon decreases, which are properties of optimal forecasts. The results showed that the most projections follow the optimal properties. In addition, a comparison was made considering forecasts issued from BP, EC, OECD and IMF. In terms of GDP growth, for current year, CFP forecasts were similar to IMF forecasts, but better than the remaining institutions. For 1 year ahead, CFP were better than EC, OECD and IMF forecasts but less accurate than BP. However, all institutions have, statistically, the same accuracy.

As mentioned, forecasts issued by other national institutes are also evaluated. Oller & Barot (2000) compares the accuracy of growth and inflation forecasts made by the OECD for 13 European countries<sup>9</sup> and forecasts made by an institute from the corresponding country studied from the period 1967-1987 for a 1 year ahead horizon. The study shows no significant difference in accuracy between the forecasts from the various institutions. An interesting finding was that inflation forecasts were significantly more accurate than growth forecasts.

## **2.2 Gaps in the literature**

Usually, papers evaluate and compare many macroeconomics variables, but GDP growth and inflation seem to be most used which is understandable since they are the most important to a country, to the policy makers and to the public in general.

In terms of horizons, literature often covers short-term forecasts (current year, 1 or 2 years ahead) with a lack of literature regarding longer forecasts horizons.

Most studies include in their work an evaluation of forecasts issued by international organizations, namely, EC, IMF, and OECD. In general, a comparison with Consensus Economics (CE) forecasts is made, however the results showed that its performance is close to international organizations' forecasts. Although, some studies suggest that sometimes, CE are significantly better than forecasts from international organizations (Batchelor, 2001).

An evaluation and comparison covering international organizations and governments has also been presented, with the studies indicating that forecasts from governments usually tend to be overestimated. However, the lack of analysis along the literature including forecasts from both international organizations and national institutions, besides the government, is visible.

Regarding the economies, most studies, official and independent, tend to evaluate the forecasts issued for European countries and for the G7 economies.

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<sup>9</sup> Germany, France, Italy, United Kingdom, Austria, Belgium, Denmark, Finland, Ireland, Netherlands, Norway, Sweden, Switzerland.

Although some studies argue that combining forecasts can lead to improve the accuracy of the forecasts, in general, it is rare to see that approach. It is only common to see a comparison between international organizations and Consensus Economics forecasts, which as mentioned, consist on the arithmetic average of a high number of forecasts.



### 3. Data and Methodology

The main contribution of this work consists in evaluating the performance of forecasts made from national and international institutions for the Portuguese economy. Besides this analysis, this dissertation also combines the forecasts to see if they are more accurate than the forecasts issued from the institutions, individually.

This chapter is divided in two parts: a first section, in which the data is presented and described, and a second section with the methods used to evaluate, compare and combine the forecasts.

#### 3.1 Data

In this Dissertation, forecasts for 2 different variables were analysed, namely the yearly GDP growth, a well-known variable that measures the economic growth of a country; and yearly inflation rate, measured by the harmonised index of consumer prices (HICP<sup>10</sup>). These are the most common to evaluate according to the literature since they are both fundamental to the economic analysis.

Regarding the institutions and the forecast horizons, the focus was on 3 national institutions and 3 international organizations, as follows:

- **Central Bank of Portugal (BP)**

The BP releases projections for the Portuguese economy, since 1997, in March (for the current year and for the two following years), in June (for the current year and for the two following years), in October (for the current year) and in December (for the current year and for the three following years), in the so-called “*Economic Bulletin*”<sup>11</sup>. As March’s projections are only available since 2019, this Dissertation focused on the projections released in June and in December, which also “*correspond to Banco de Portugal’s contribution to the Eurosystem’s projections published by the ECB*” (Banco de Portugal, n.d.).

- **Portuguese Public Finance Council (CFP)**

The CFP is an independent body in Portugal that started its activity recently, in 2012. Twice a year, since 2015, in March and September, the CFP publishes the “*Economic and Fiscal*

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<sup>10</sup> The HICP measures the changes over times in the prices of consumer goods and services acquired by households (Eurostat, n.d.).

<sup>11</sup> Available at: <https://www.bportugal.pt/en/publications/banco-de-portugal/all/381>.

*Outlook*”<sup>12</sup>, initially called “*Public Finance: Position and Constraints*”, which includes projections for the current year and for the four following years.

- **Ministry of Finance (MF)**

Forecasts are prepared by the Directorate-General for the Budget of the Portuguese Ministry of Finance and are released within the “*state budget report*”<sup>13</sup>, usually, in October<sup>14</sup>. Forecasts of different variables are issued for the current year and for 1 year ahead.

- **European Commission (EC)**

The EC releases macroeconomics forecasts four time a year (in winter, spring, summer, and autumn), since 1998, in the “*European Economic Forecast*”<sup>15</sup>, for the current year and up to two years ahead. The forecasts released in spring (May) and in autumn (November) are fully-fledged forecasts and the ones releases in summer (July) and in winter (February) are interim forecasts. In this sense, this study selects the forecasts issued in May and in November to evaluate and compare.

- **Organization for Economic Cooperation and Development (OECD)**

Moreover, the OECD publishes its macroeconomics projections, in the so-called “*Economic Outlook*”<sup>16</sup>, twice a year, since 1967, in May/June and November/December for the current year and for the two following years.

- **International Monetary Fund (IMF)**

Twice a year, the IMF publishes in April and October, since 1999, its projections in the “*World Economic Outlook*”<sup>17</sup> for the current year and for the five following years.

As noticed, the institutions do not provide the forecasts at the same time as summarized in Table 1.

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<sup>12</sup> Available at: <https://www.cfp.pt/en/publications/economic-and-fiscal-outlook>.

<sup>13</sup> Available at: <https://www.dgo.gov.pt/Paginas/default.aspx>.

<sup>14</sup> The State Budget Report is a proposal from the Portuguese Government.

<sup>15</sup> Available at: [https://economy-finance.ec.europa.eu/economic-forecast-and-surveys\\_en](https://economy-finance.ec.europa.eu/economic-forecast-and-surveys_en).

<sup>16</sup> Available at: [https://www.oecd-ilibrary.org/economics/oecd-economic-outlook\\_16097408](https://www.oecd-ilibrary.org/economics/oecd-economic-outlook_16097408).

<sup>17</sup> Available at: <https://www.imf.org/en/Publications/SPROLLS/world-economic-outlook-databases>.

**Table 1. Time of publication of institutions**

		1 <sup>st</sup> semester	2 <sup>nd</sup> semester
<b>National institutions</b>	BP	June	December
	CFP	March	September
	MF		October
<b>International organizations</b>	EC	May	November
	OECD	May/June	November/December
	IMF	April	October

For example, in the first semester, forecasts from BP (June) are issued later compared to others. In the second semester, BP and OECD forecasts are released in December and late November, respectively, while the other forecasts are issued earlier. This was a detail that needs to be considered while analysing the results because some institutions may have more updated information than others, and consequently end up making smaller errors.

To evaluate the predictions, the real observed values were gathered from INE (Statistics Portugal database), as described in Table 2 and illustrated in Figure 1 and Figure 2.

**Table 2. Data from INE**

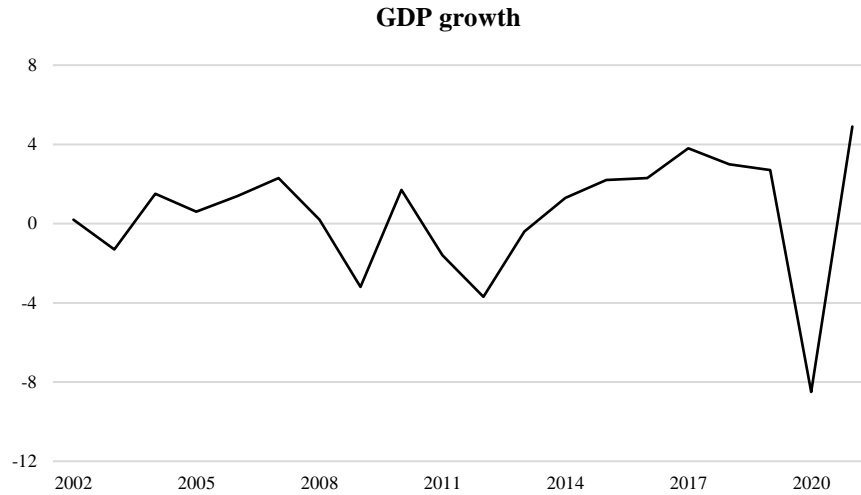
	Definition	Unit
<b>GDP growth</b>	Real gross domestic product per capita (Annual growth rate - Base 2016 - %) <sup>18</sup>	Percentage (%)
<b>Inflation rate</b>	Harmonized index of consumer prices (12-month average growth rate - Base 2015 - %) <sup>19</sup>	Percentage (%)

<sup>18</sup> Available at:

[https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine\\_indicadores&indOcorrCod=0009888&contexcto=bd&selTab=tab2](https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_indicadores&indOcorrCod=0009888&contexcto=bd&selTab=tab2).

<sup>19</sup> Available at:

[https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine\\_indicadores&indOcorrCod=0000111&contexcto=bd&selTab=tab2](https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_indicadores&indOcorrCod=0000111&contexcto=bd&selTab=tab2).



**Figure 1. GDP growth – real observed value**



**Figure 2. Inflation - real observed values**

The forecasts were divided considering the publication date, if they were published in the first or second semester, as shown in Table 3. The current year forecasts (6 months ahead) are those made in the second (first) semester of the same year. The 1 year ahead (18 months ahead) forecasts are those made in the second (first) semester of the previous year. This was also a problem that resulted from the process of collecting the data: the data availability of the variables for each institution. The number of observations for longer horizons is too small, so it was a choice to not evaluate and compare forecasts for larger horizons.



**Table 3. Forecast horizon and publication date**

<b>Year</b>	<b>Forecast horizon</b>	<b>Publication date</b>
n	Current year	2 <sup>nd</sup> semester n
	6 months ahead	1 <sup>st</sup> semester n
	1 year ahead	2 <sup>nd</sup> semester n-1
	18 months ahead	1 <sup>st</sup> semester n-1

Adapted from Abreu (2011)

Regarding the period of analysis, due to the lack of data<sup>20</sup> for some institutions and to be coherent, this study focused mainly on a longer period, between 2002-2021 (20 observations) for the current year and 6 months ahead and between 2003-2021 (19 observations) for the 1 year ahead and 18 months ahead. This longer period included forecasts from 2 national institutions: BP and MF (MF only available for the current year and 1 year ahead) and 3 international institutions, EC, OECD and IMF, as summarized in Table 4.

**Table 4. Forecasts availability - longer period**

	<b>Longer period</b>			
	<b>Current year</b>	<b>6 months ahead</b>	<b>1 year ahead</b>	<b>18 months ahead</b>
<b>BP</b>	2002-2021	2002-2021	2003-2021	2003-2021
<b>CFP</b>	Not available	Not available	Not available	Not available
<b>MF</b>	2002-2021*	Not available	2003-2021*	Not available
<b>EC</b>	2002-2021	2002-2021	2003-2021	2003-2021
<b>OECD</b>	2002-2021	2002-2021	2003-2021	2003-2021
<b>IMF</b>	2002-2021	2002-2021	2003-2021	2003-2021

\* MF inflation forecasts are only available from year 2006 and 2007, depending on the forecast horizon, consequently they were not considered in this period.

To include the CFP forecasts, a shorter period was studied, as shown in Table 5, although it requires attention while analysing the performance of the forecasts. Namely, between 2016-2021 (6 observations) for the current year and 6 months ahead and between 2017-2021 (5 observations) for the 1 year ahead and 18 months ahead.

<sup>20</sup> See Table A.1, in appendix, for data availability of the various institutions.

**Table 5. Forecasts availability - shorter period**

	Shorter period			
	Current year	6 months ahead	1 year ahead	18 months ahead
<b>BP</b>	2016-2021	2016-2021	2017-2021	2017-2021
<b>CFP</b>	2016-2021	2016-2021	2017-2021	2017-2021
<b>MF</b>	2016-2021	Not available	2017-2021	Not available
<b>EC</b>	2016-2021	2016-2021	2017-2021	2017-2021
<b>OECD</b>	2016-2021	2016-2021	2017-2021	2017-2021
<b>IMF</b>	2016-2021	2016-2021	2017-2021	2017-2021

Even though the year 2020 and 2021 was included in this study, it is important to note that the real values gathered from INE are still a projection.

### 3.2 Methodology

As mentioned, the research is divided into two parts – evaluating the forecasts from the various and institutions and combining the forecasts to see if they have a better performance than the forecasts issued from the national and international institutions.

The tool selected to evaluate the forecasts is the software Stata 17.

#### 3.2.1 Accuracy

To assess accuracy, it is essential to compare the forecasts with the actual values that are observed. So, it is important to define the forecast error,  $\hat{e}_t$ , which is the difference between the real observed value,  $y_t$ , and the forecast value,  $\hat{y}_t$ , where  $t$  is the specific year. Therefore, for the forecast horizon  $h$  it can be written as:

$$\hat{e}_{t,h} = y_t - \hat{y}_{t,h} \quad (1)$$

For the different forecast horizons, it can be defined as follows:

$$\hat{e}_{t,2^{nd} \text{ semester}_t} = y_t - \hat{y}_{t,2^{nd} \text{ semester}_t} \quad \text{for the current year} \quad (2)$$

$$\hat{e}_{t,1^{st} \text{ semester}_t} = y_t - \hat{y}_{t,1^{st} \text{ semester}_t} \quad \text{for the 6 months ahead} \quad (3)$$

$$\hat{e}_{t,2^{nd} \text{ semester}_{t-1}} = y_t - \hat{y}_{t,2^{nd} \text{ semester}_{t-1}} \quad \text{for the 1 year ahead} \quad (4)$$

$$\hat{e}_{t,1^{st} \text{ semester}_{t-1}} = y_t - \hat{y}_{t,1^{st} \text{ semester}_{t-1}} \quad \text{for the 18 months ahead} \quad (5)$$

After calculating the forecast errors, a set of summary statistics is used to determine the accuracy, which are the most common referred in the literature (Chabin et al., 2020).

- **Mean Error (ME)**

The ME is the average forecast error. This measure is not considered a good measure because the positive and negative errors can offset each other, although by looking at the sign some conclusions may be taken, related to a possible bias, but always with careful. A positive sign indicates that, on average, an institution is being optimistic/overestimating while a negative sign indicates that, on average, an institution is being pessimistic/underestimating. However, this can be confirmed by testing for unbiasedness as mentioned later in this section.

The ME can be defined as follows, where T is the number of observations:

$$ME_{t,h} = \frac{1}{T} \sum_{t=1}^T \hat{e}_{t,h} \quad (6)$$

- **Mean Absolute Error (MAE)**

The MAE is the average absolute forecast error, meaning that, it does not provide any information about the direction of the error, in other words, a possible bias. It weights all forecast errors equally. The lower MAE is, the more accurate the forecasts are. Formally, it can be defined as follows:

$$MAE_{t,h} = \frac{1}{T} \sum_{t=1}^T |\hat{e}_{t,h}| \quad (7)$$

- **Root Mean Squared Error (RMSE)**

The RMSE is the square root of the average of the squared forecasts errors as defined below. This is the most used measure according to the existing literature and indicates by how many units, on average, the forecast differs from the real value. The RMSE gives high weights to large errors since the errors are squared. The lower RMSE is, the more accurate the forecasts are.

$$RMSE_{t,h} = \sqrt{\frac{1}{T} \sum_{t=1}^T \hat{e}_{t,h}^2} \quad (8)$$

The difference between the last 2 measures is the fact that, RMSE is always larger or equal than the MAE. If they are both equal, it means that the errors have the same magnitude.

### 3.2.2 Unbiasedness and efficiency

In addition, an unbiased and efficient forecast can be considered an optimal forecast. Unbiasedness requires forecasts errors to be close to zero on average, meaning that there should not be any systematic over or underprediction (Fioramanti et al., 2016).

To test for unbiasedness, various tests can be computed. A necessary condition for unbiasedness is explained, in general, in the following regression:

$$\hat{e}_t = \alpha + \varepsilon_t \quad (9)$$

The forecast error,  $\hat{e}_t$ , is regressed on a constant. If the forecasts are unbiased, the coefficient,  $\alpha$ , should not be statistically different from zero, implying that the null hypothesis ( $\alpha = 0$ ), using a simple t-test, should not be rejected at a determined significance level.

Efficiency is related to both unbiasedness and the absence of serial correlation in the forecast errors, implying that if the errors are serially correlated, it is possible to improve the forecast by using information on known past errors (Gonçalves, 2022).

Regarding forecast efficiency, it can be tested using the following general regression:

$$y_t = \alpha + \beta \hat{y}_t + \varepsilon_t \quad (10)$$

For a forecast to be (strongly) efficient, it is necessary that unbiasedness and the absence of serial correlation in the forecast errors jointly hold,  $\alpha = 0$  and  $\beta = 1$ . The null hypothesis is tested using a F-type test, and if it is rejected, it implies that at least one of the properties, unbiasedness or uncorrelated errors, do not hold. This is known as Mincer-Zarnowitz regressions and, along the literature, is the most common approach when testing for efficiency.

In addition, for these tests to be valid, an extra test (Breusch-Godfrey) needs to be performed to infer if the residuals of the test regressions are not serially correlated. If the residuals are found to be serially correlated, the standard errors are corrected using the Newey and West procedure (Newey & West, 1987).

### 3.2.3 Assessing the accuracy between forecasts

The difference between two forecast methods can be statistically assessed using different test statistics. This dissertation studies the relative accuracy between the various institutions using

the Diebold-Mariano test statistics (DM) (Diebold and Mariano, 1995) and a modified version of the DM test statistic (HLN) proposed by Harvey, Leybourne and Newbold (1998).

The DM test assesses the quality of each forecast using a loss function of the forecast error (Novotný & Raková, 2011). The Mean Squared Error (MSE) loss differential is used, for any pair of methods 1 and 2, as follows:

$$\bar{d} = MSE_1 - MSE_2 \quad (11)$$

The DM test statistic is defined as:

$$DM = H^{1/2} \frac{\sum_{j=1}^H d_j / H}{\sigma_d} = H^{1/2} \frac{\bar{d}}{\sigma_d}, \quad (12)$$

where  $d_j$  is, for period  $j$ , the difference between the squared error for method 1 and the squared error for method 2,  $H$  is the number of forecast periods, and  $\sigma_d$  is the standard deviation of the differential. Later, Harvey, Leybourne, and Newbold (1998) suggested a modified version of the DM test statistic, defined as:

$$HLN = \left( \frac{H + 1 - 2h + H^{-1}h(h - 1)}{HH} \right)^{\frac{1}{2}} DM \quad (13)$$

In this sense, considering a 5% significance level, if the observed DM or HLN is between -1.96 and +1.96, the null hypothesis is not rejected, indicating that the forecasts have the same accuracy. If the observed DM or HLN is smaller than -1.96, then the first model is better than the second model. If it is greater than +1.96, it is the other way around, the second model is better than the first.

### 3.2.4 Forecast combination

As mentioned in the literature review, forecast combination is known as a good procedure to improve the forecast accuracy. In this part of the Dissertation, the focus is on analysing different forecast combinations considering the longer period since there are more observations available (2002-2021 for forecasting the current year and 6 months ahead and 2003-2021 for 1 year ahead and 18 months ahead).

Therefore, the goal is to have a combination that consists on the simple arithmetic average of all institutions, national and international (all); a combination that consists on the simple arithmetic average of the national institutions (national); a combination that consists on the simple arithmetic average of the international institutions (international); and a combination

that excludes the worst and the best institutions and consists on the simple arithmetic of the remaining institutions (trimmed).

To analyse the accuracy of the forecasts, summary measures will be computed, namely, the MAE and the RMSE, as described earlier in section 3.2.1. In addition, the relative accuracy between different combined forecasts and also between combined forecasts and single institutions are studied using the Diebold Mariano test as well as its modified version.

The combined forecast of all institutions has a higher number of institutions involved and is the closest to the approach of Consensus Economics, consequently these are the results more interesting to our analysis.

Considering that the Dissertation focus on different variables and forecast horizons, the forecast combination clearly depends on those 2 factors. In the following Table 6, it is described the main details of the combination.

**Table 6. Forecast combination – details**

	<b>Current year</b>	<b>6 months ahead</b>	<b>1 year ahead</b>	<b>18 months ahead</b>
<b>all</b>	GDP growth - 5 institutions Inflation - 4 institutions	4 institutions for both variables	GDP growth - 5 institutions Inflation - 4 institutions	4 institutions for both variables
<b>national</b>	GDP growth - 2 institutions Inflation – not available	Not available for both variables, because BP forecasts are the only ones available.	GDP growth - 2 institutions Inflation – not available	Not available for both variables, because BP forecasts are the only ones available.
<b>international</b>	3 institutions for both variables	3 institutions for both variables	3 institutions for both variables	3 institutions for both variables
<b>trimmed</b>	GDP growth – 3 institutions Inflation – 2 institutions	2 institutions for both variables	GDP growth – 3 institutions Inflation – 2 institutions	2 institutions for both variables

# 4. Empirical results

In this section, the aim is to compare the performance of forecasts by the different institutions, over a longer and a shorter period, for the 4 distinct forecast horizons by looking at the ME, MAE, and RMSE. This section also considers the unbiasedness and efficiency tests of the forecast errors as the assessment of the relative accuracy across forecast methods.

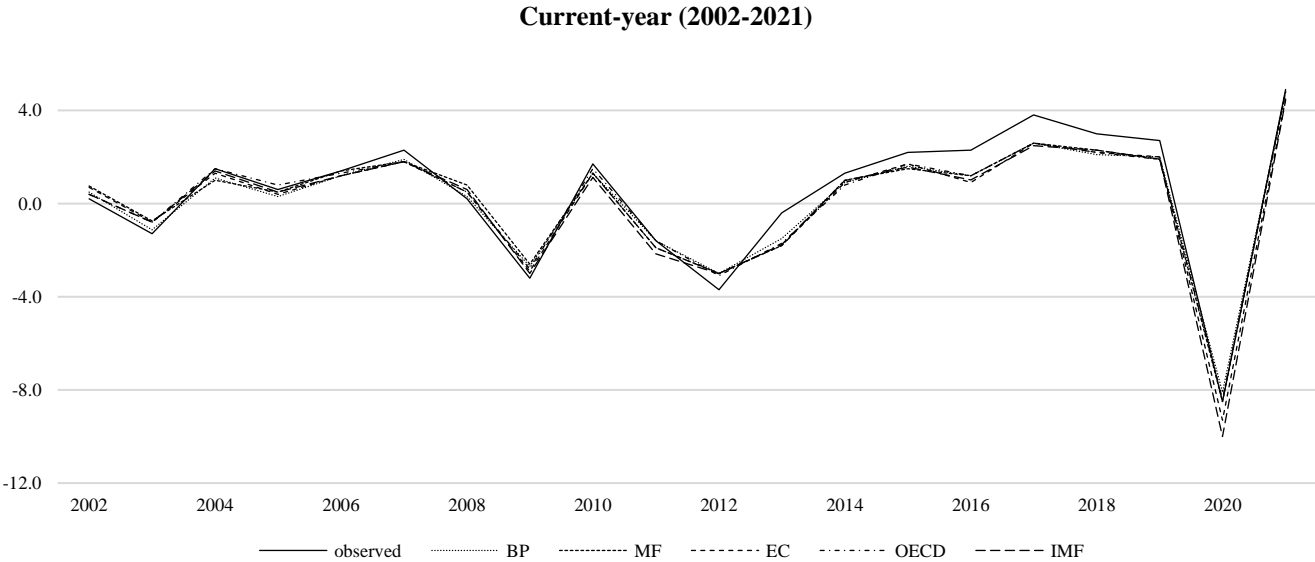
In the second part of this section, the goal is to present the results of the forecast combinations and proceed by analysing the results considering the performance of each institution.

## 4.1 Longer period

### 4.1.1 GDP growth

- Accuracy

First, it is important to have a general overview of the forecast errors over time by looking at the following figures. Figure 3 illustrates the forecast errors of each institution for the current year, figure 4 for 6 months ahead, figure 5 for 1 year ahead, and figure 6 for the 18 months ahead. The figures show that longer that, longer the horizon, the less accurate the forecasts are.



**Figure 3. GDP growth current year forecasts (real outcomes and institutions) - longer period**

6 months ahead (2002-2021)

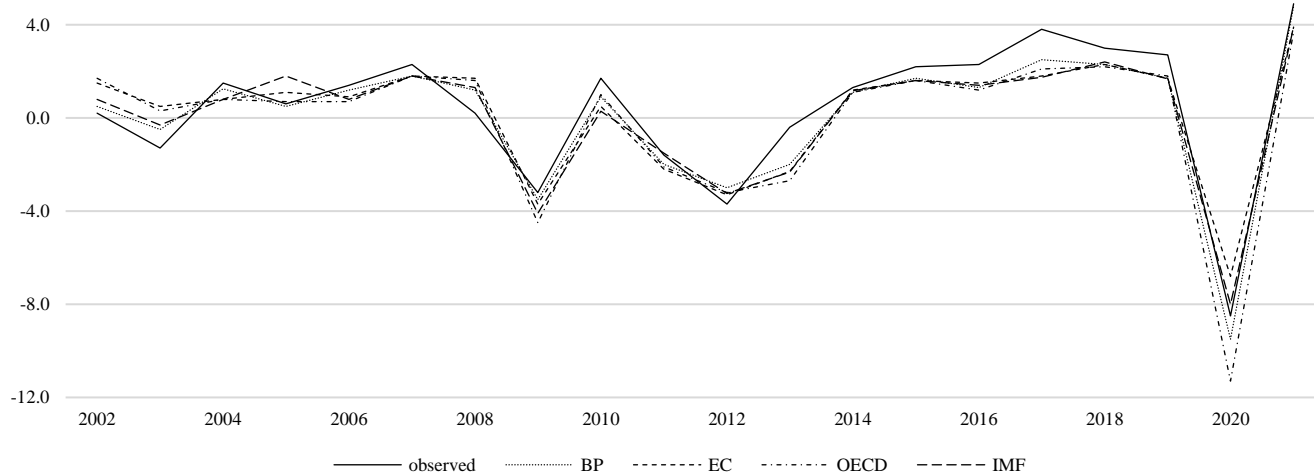


Figure 4. GDP growth 6 months ahead forecasts (real outcomes and institutions) - longer period

1 year ahead (2003-2021)

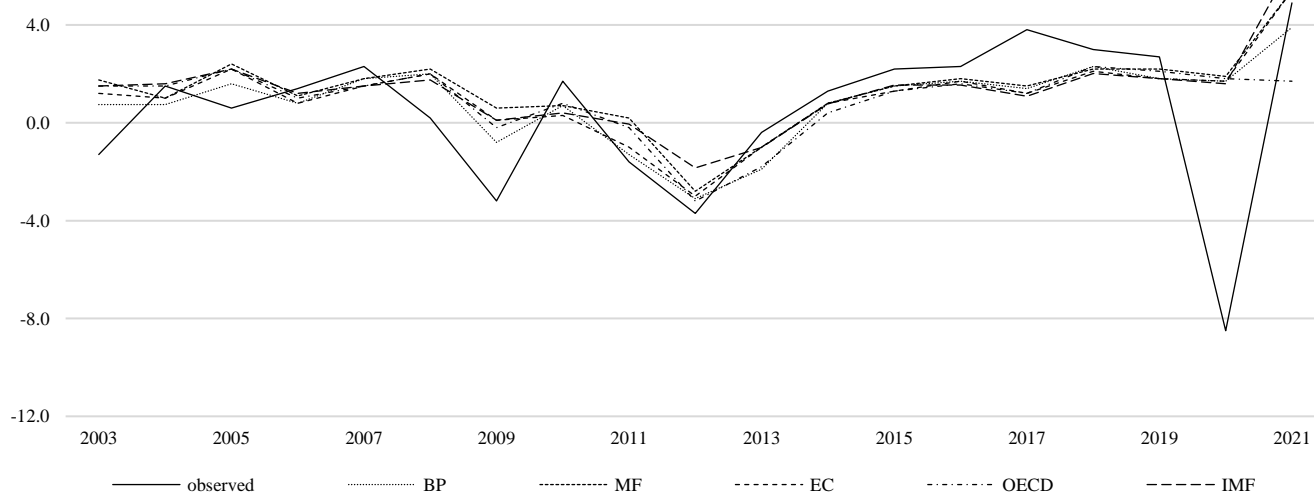
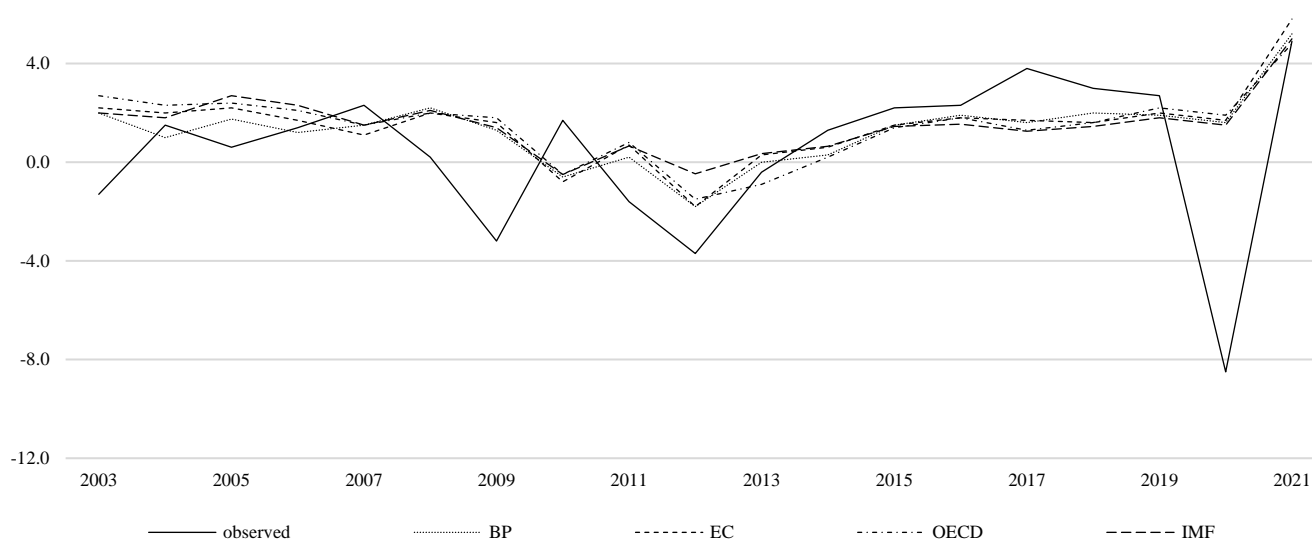


Figure 5. GDP growth 1 year ahead forecasts (real outcomes and institutions) - longer period



### 18 months ahead (2003-2021)



**Figure 6. GDP growth 18 months ahead forecasts (real outcomes and institutions) - longer period**

According to Table 7, that presents the mean error for the various institutions and forecast horizons, for the current year and 6 months ahead forecasts, the ME has a positive sign, so the forecasts tend to be optimistic. In other hand, by examining the results for the 1 year ahead and 18 months ahead forecasts, the ME has a negative sign, so institutions are, on average, underpredicting, with the exception of IMF for 18 months ahead.

**Table 7. GDP growth forecasts – ME – longer period**

	2002-2021		2003-2021	
	Current year	6 months ahead	1 year ahead	18 months ahead
<b>BP</b>	0.281	0.358	-0.379	-0.818
<b>MF</b>	0.255		-0.845	
<b>EC</b>	0.355	0.245	-0.574	-0.984
<b>OECD</b>	0.24	0.545	-0.437	-0.984
<b>IMF</b>	0.421	0.37	-0.789	1.014

Notes: results in percentage points.

Regarding MAE and RMSE, the Table 8 presents the rankings across institutions considering both summary statistics.

For the current year forecasts, the OECD presents the lowest value for the MAE (0.470 p.p.), followed by the BP (0.499 p.p.), indicating, that OECD is making, on average, an error of 0.470 p.p. and BP an error of 0.499 p.p., respectively. This is unexpected because BP is the

latest institution to provide the forecasts, so in theory, it may be the institution with more updated information. In other hand, by looking at the RMSE, BP has the lowest value (0.605 p.p.), followed by the OECD (0.607 p.p.) but with almost no difference at all. The IMF has the highest values in both measures (MAE=0.620 p.p.; RMSE=0.750 p.p.), and in this horizon it is considered the least accurate institution.

Comparing the results for 6 months ahead forecasts, BP turns out to be the best at forecasting since it provides the lowest values for both MAE (0.638 p.p.) and RMSE (0.759 p.p.). On the opposite side, OECD is the worst institution at forecasting GDP growth (MAE=1.055 p.p.; RMSE=1.249 p.p.), compared to the rest.

For 1 year ahead, BP presents the lowest values for both MAE (1.553 p.p.) and RMSE (2.639 p.p.), and the OECD the highest values (MAE=1.816 p.p.; RMSE=2.784 p.p.). For 18 months ahead, the results are consistent with the previous forecast horizon. To forecast GDP growth, regarding the MAE, the IMF is the least accurate institution, while OECD in other hand is the least accurate institution regarding RMSE.

**Table 8. GDP growth forecasts – MAE and RMSE - from best (1) to worst (5) – longer period**

	Current year		6 months ahead		1 year ahead		18 months ahead	
	MAE	RMSE	MAE	RMSE	MAE	RMSE	MAE	RMSE
1	0.470 (OECD)	0.605 (BP)	0.638 (BP)	0.759 (BP)	1.553 (BP)	2.639 (BP)	1.861 (BP)	2.901 (BP)
2	0.499 (BP)	0.607 (OECD)	0.864 (IMF)	0.997 (IMF)	1.658 (EC)	2.729 (EC)	2.016 (EC)	3.004 (EC)
3	0.555 (MF)	0.667 (MF)	0.965 (EC)	1.110 (EC)	1.708 (MF)	2.784 (IMF)	2.079 (OECD)	3.023 (IMF)
4	0.585 (EC)	0.689 (EC)	1.055 (OECD)	1.249 (OECD)	1.785 (IMF)	2.834 (MF)	2.083 (IMF)	3.109 (OECD)
5	0.620 (IMF)	0.750 (IMF)			1.816 (OECD)	2.851 (OECD)		

Notes: results in percentage points.

To sum up, the BP is consistently the best institution of all at forecasting growth. One of the reasons can be the fact that BP issues its projections later than the rest, in June and in December. Regarding the best international organization at forecasting growth, it depends on the forecast horizon. For 1 year ahead and 18 months-ahead, EC takes the lead, while for the current year, it is OECD and for 6 months ahead, it is the IMF, however regarding the other forecasts horizons they are normally in the last positions. Comparing EC and IMF publication dates, the EC issues its forecasts one month later than IMF, so it may have more information

available. In other hand, OECD releases its projections in late November/December, later than EC and IMF. The performance of MF, in other hand, is even better than some international organizations (EC for the current year, OECD for the 1 year ahead, and IMF for both forecast horizons).

- **Unbiasedness and efficiency**

The Breusch-Godfrey test indicates that there is no serial correlation of any order up to 4 lags, for all the forecasts horizons and institutions (see Table A.2 in appendix). This means that there is no need to correct the standard errors to account for serial correlation.

In general, considering the results in Table A.3, it appears that, at a 5% significance level, the forecasts from MF and OECD for the current year are unbiased (the null hypothesis is not rejected). In other hand, the forecasts from BP (p-value=0.034), EC (p-value=0.017) and IMF (p-value=0.008) have a positive bias, implying that these institutions are, on average, overestimating GDP for the current year. About 6 months ahead forecasts, at 5% significance level, the null hypothesis is rejected, for BP (p-value=0.031) and OECD (p-value=0.048), indicating, once again, on average, an overestimation of GDP. Since the null hypothesis is not rejected for longer forecast horizons, it suggests that the remaining forecasts are all unbiased.

Regarding efficiency tests, the results show that the joint hypothesis, at 5% significance level, is rejected only for BP (p-value=0.0043) and IMF (p-value=0.0310) for current year forecasts, which indicates that strong efficiency for these institutions does not hold, and it is possible to improve these forecasts. For 6 months ahead, the hypothesis is also rejected in the case of OECD (p-value=0.0249), so strong efficiency does not hold. For the other forecasts horizons, the joint hypothesis is not rejected at 5% significance level, which shows that the forecasts are (strongly) efficient.

- **Assessing the accuracy**

According to the results<sup>21</sup> of the DM test statistics and the modified version of DM proposed by HLN, statistically, all the institutions' projections have the same relative accuracy.

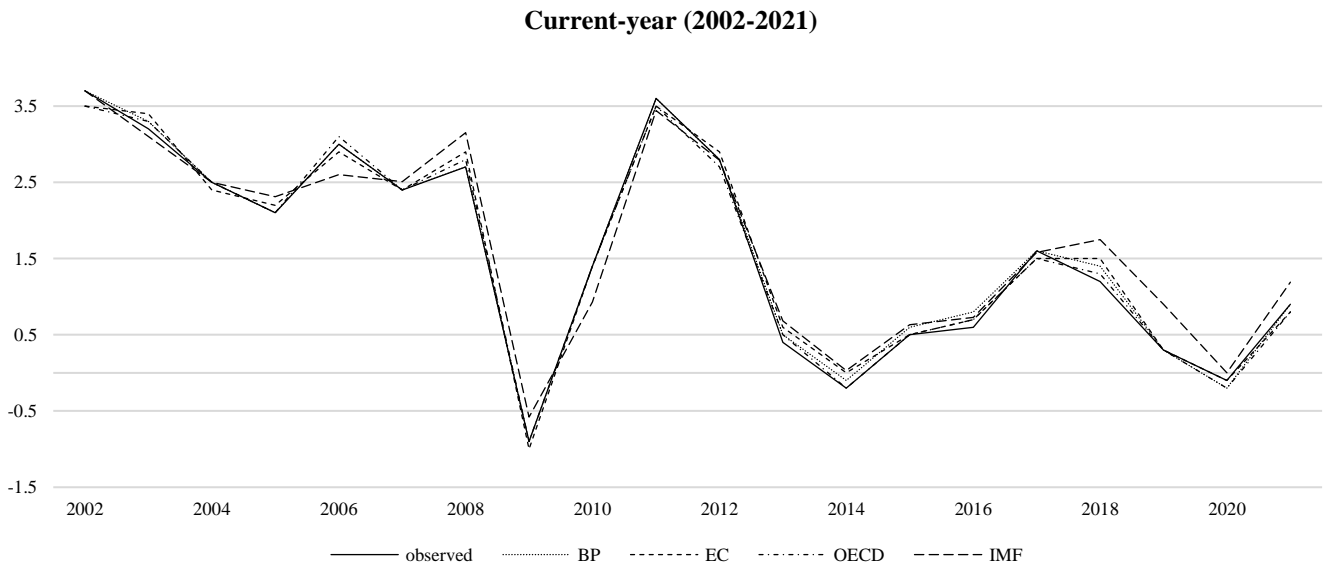
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<sup>21</sup> See Table A.4 and A.5 in the appendix for more details.

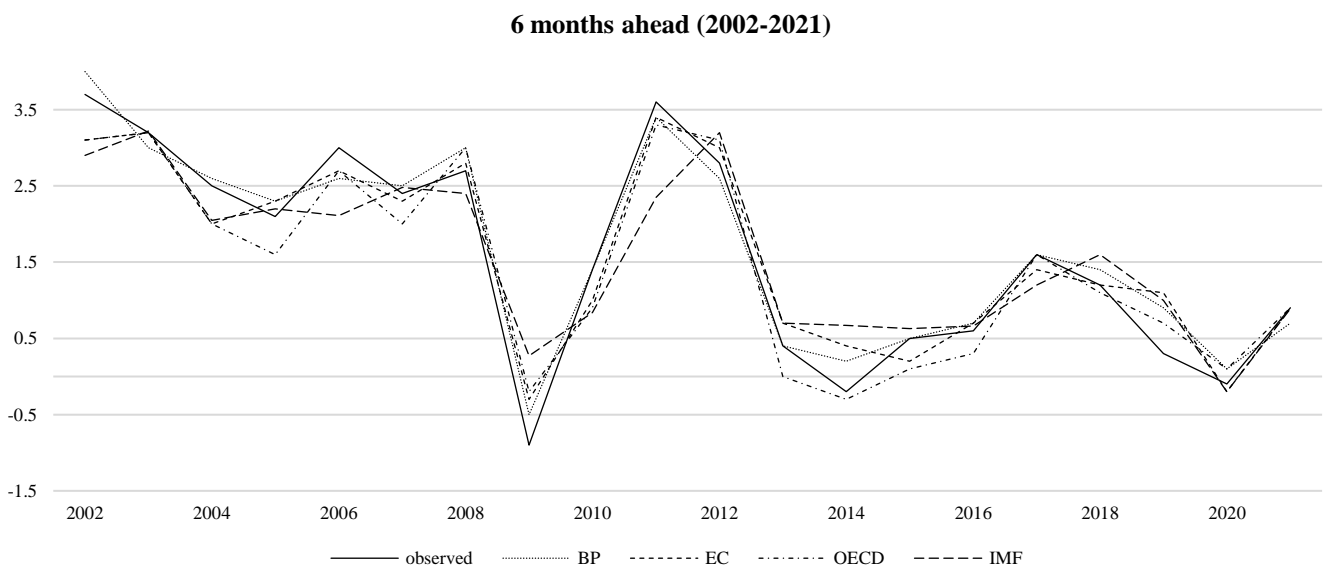
## 4.1.2 Inflation

- Accuracy

As in the case of GDP growth, it is important to have a general overview of the forecast errors over time. Figure 7 illustrates the forecast errors of each institution for the current year, figure 8 for 6 months ahead, figure 9 for 1 year ahead, and figure 10 for the 18 months ahead. The conclusions regarding accuracy are also similar: projections for the current year seem more accurate than for longer horizons.

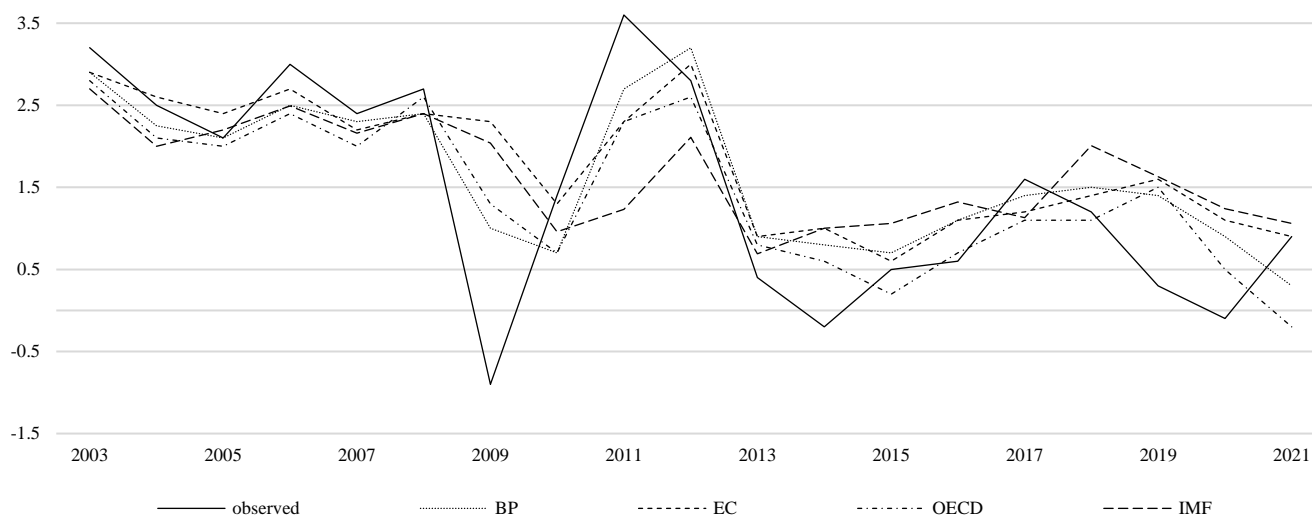


**Figure 7. Inflation current year forecasts (real outcomes and institutions) - longer period**



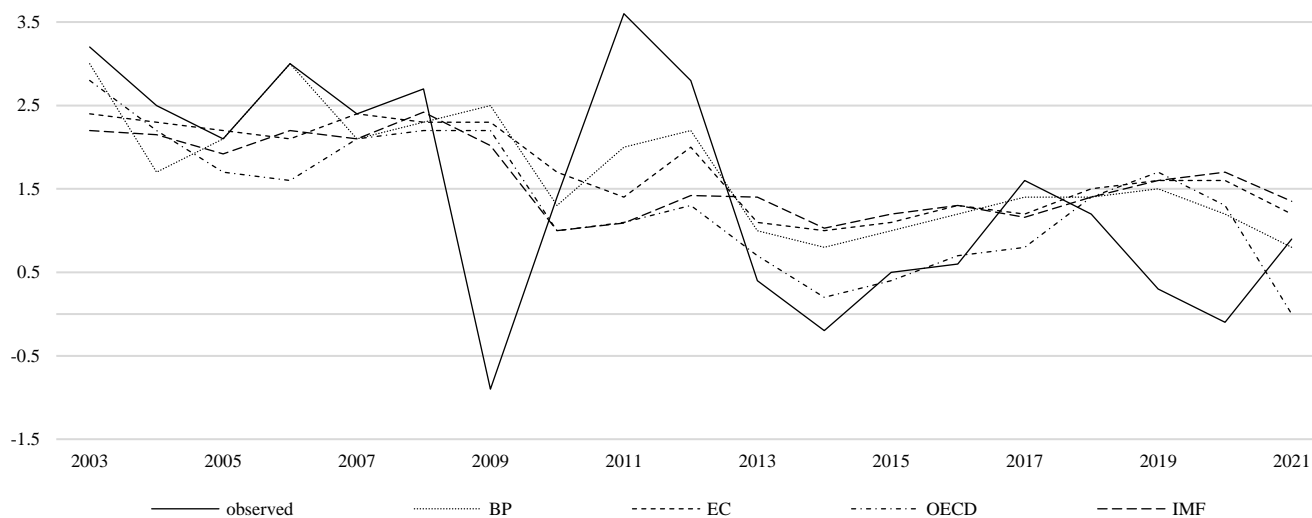
**Figure 8. Inflation 6 months ahead forecasts (real outcomes and institutions) - longer period**

### 1 year ahead (2003-2021)



**Figure 9. Inflation 1 year ahead forecasts (real outcomes and institutions) - longer period**

### 18 months ahead (2003-2021)



**Figure 10. Inflation 18 months ahead forecasts (real outcomes and institutions) - longer period**

Considering Table 9, that presents the mean error for the various institutions and forecast horizons. The ME has a negative sign for all forecast horizons, indicating that institutions tend to, on average, underpredict inflation. However, there is two situations where the opposite occurs: OECD forecasts present a positive sign for all forecast horizons and IMF for the 6 months ahead.

**Table 9. Inflation forecasts – ME – longer period**

	2002-2021		2003-2021	
	Current year	6 months ahead	1 year ahead	18 months ahead
<b>BP</b>	-0.035	-0.085	-0.161	-0.237
<b>EC</b>	-0.030	-0.010	-0.311	-0.247
<b>OECD</b>	0.005	0.125	0.047	0.137
<b>IMF</b>	-0.112	0.027	-0.181	-0.14

Notes: results in percentage points.

Regarding the MAE and RMSE presented in Table 10, for the current year forecasts, BP has the lowest values for both MAE (0.045 p.p.) and RMSE (0.081 p.p.) and for 6 months ahead forecasts, BP has the lowest values for both MAE (0.205 p.p) and RMSE (0.285 p.p). The fact that BP is winning in both horizons coincides with GDP growth results, however the dimension of the MAE and RMSE is smaller in the case of inflation forecasts, implying that institutions are making less errors when forecasting inflation. Regarding the worst forecasting institution, it is the IMF in both forecast horizons. For 1 year ahead and 18 months ahead forecasts, BP is the best institution, presenting the lowest values for both summary statistics, while IMF is the less accurate institution, with the highest values.

**Table 10. Inflation forecasts – MAE and RMSE - from best (1) to worst (4) – longer period**

	Current year		6 months ahead		1 year ahead		18 months ahead	
	MAE	RMSE	MAE	RMSE	MAE	RMSE	MAE	RMSE
1	0.045 (BP)	0.081 (BP)	0.205 (BP)	0.285 (BP)	0.566 (BP)	0.719 (BP)	0.689 (BP)	1.042 (BP)
2	0.065 (OECD)	0.087 (OECD)	0.280 (EC)	0.361 (EC)	0.605 (OECD)	0.798 (OECD)	0.847 (EC)	1.151 (EC)
3	0.110 (EC)	0.138 (EC)	0.315 (OECD)	0.371 (OECD)	0.616 (EC)	0.964 (EC)	0.863 (OECD)	1.185 (OECD)
4	0.228 (IMF)	0.292 (IMF)	0.450 (IMF)	0.585 (IMF)	0.814 (IMF)	1.092 (IMF)	0.944 (IMF)	1.208 (IMF)

Notes: results in percentage points.

Inflation results are much more consistent across institutions, showing that BP is considered the most accurate institution and IMF the least accurate.

- **Unbiasedness and efficiency**

The Breusch-Godfrey test was also performed to infer if the residuals are not serially correlated. However, in this case, in some institutions and forecast horizons, the null hypothesis was rejected at a determined significance level, as summarized in detail in Table A.6. Since it was necessary to correct the standard errors, the unbiasedness and efficiency tests results in Table A.7 already include this correction.

Regarding unbiasedness tests, for the current year forecasts, the null hypothesis is not rejected at 5% significance level. At 10% significance level, IMF forecasts are the only biased forecasts, which indicated that this institution is, on average, underestimating inflation. For the other forecasts horizons, the null hypothesis is not rejected, suggesting that forecasts are all unbiased.

Considering efficiency tests, the joint hypothesis is not rejected at any significance level for the current year and for 18 months ahead forecasts. For the 6 months ahead, at 5% significance level, the joint hypothesis is rejected for EC (p-value=0.0023) and IMF (p-value=0.0133) forecasts, implying that (strong) efficiency do not hold in these cases, so it is possible to improve these forecasts. BP forecasts are also not (strongly) efficient for the 1 year ahead, since the hypothesis is rejected at a 5% significance level (p-value=0.0264).

- **Assessing the accuracy**

The results<sup>22</sup> suggest that, as in the case of GDP growth, all the institutions, when forecasting inflation, have the same relative accuracy, since the null hypothesis is never rejected.

## **4.2 Shorter period**

### **4.2.1 GDP growth**

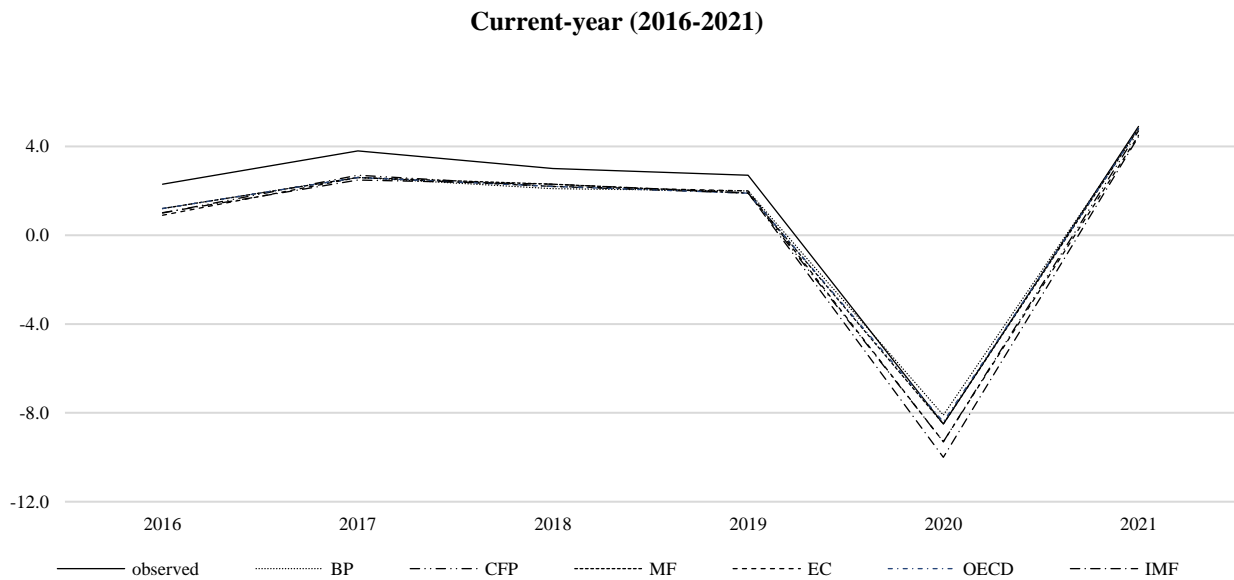
- **Accuracy**

- Considering that this period of analysis is shorter, it may be easier to analyse the figures that give an overview of the forecast errors of the various institutions. Figure 11 illustrates the forecast errors of each institution for the current year, figure 12 for 6 months ahead, figure 13 for 1 year ahead, and figure 14 for the 18 months ahead. It is shown that for current year and 6 months ahead, the forecasts are relatively closer to the real observed values. For

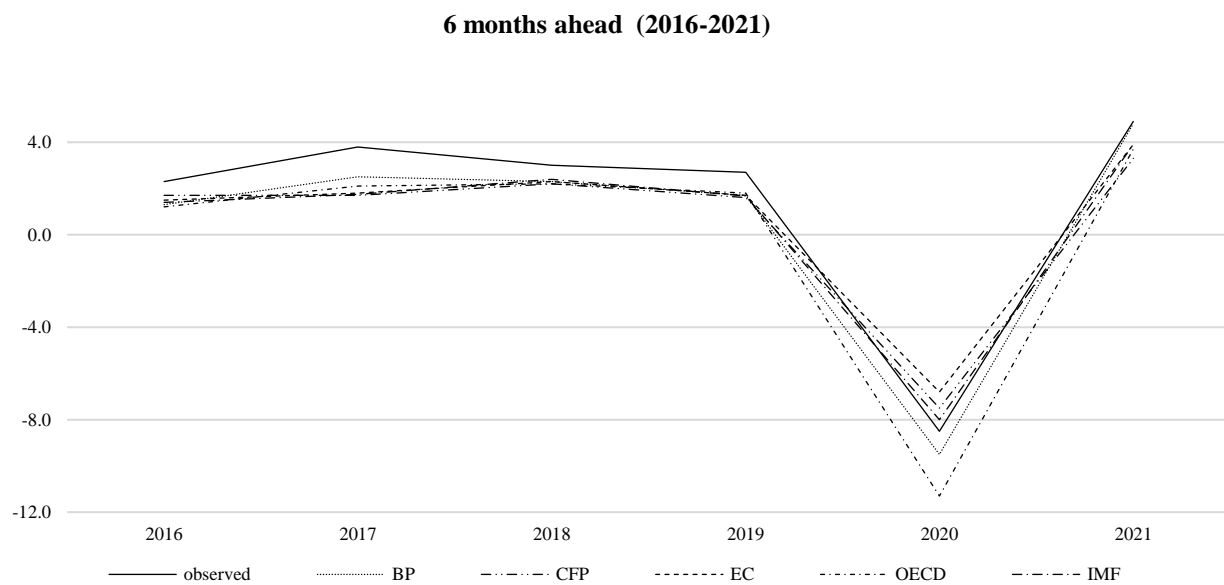
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<sup>22</sup> See Table A.8 and A.9 in appendix for more details.

longer horizons, nothing can be said with certainty since the performance of institutions is quite similar.

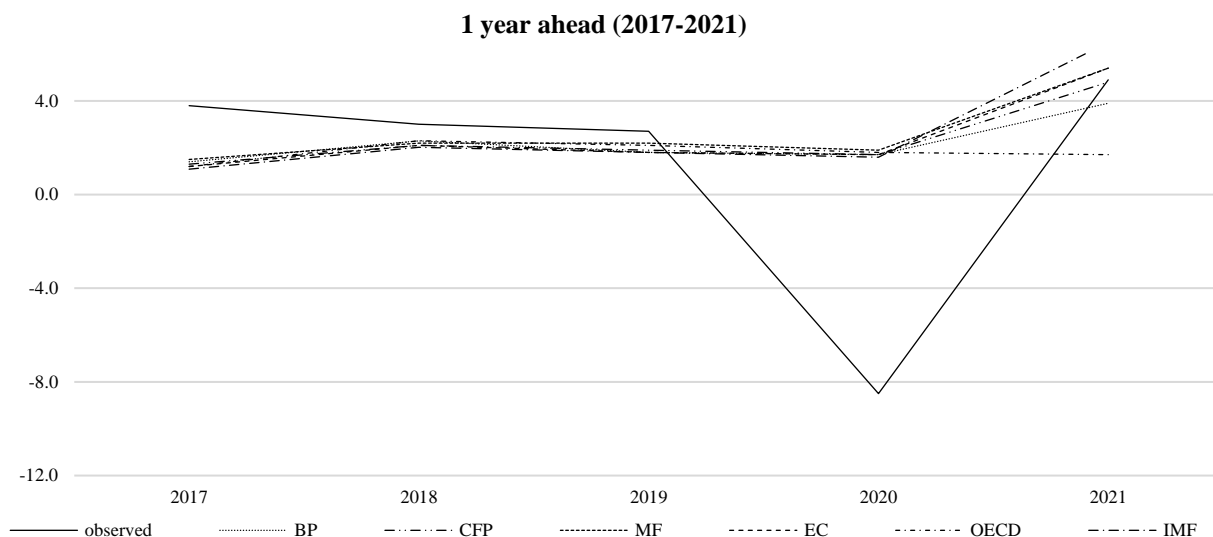


**Figure 11. GDP growth current year forecasts (real outcomes and institutions) - shorter period**

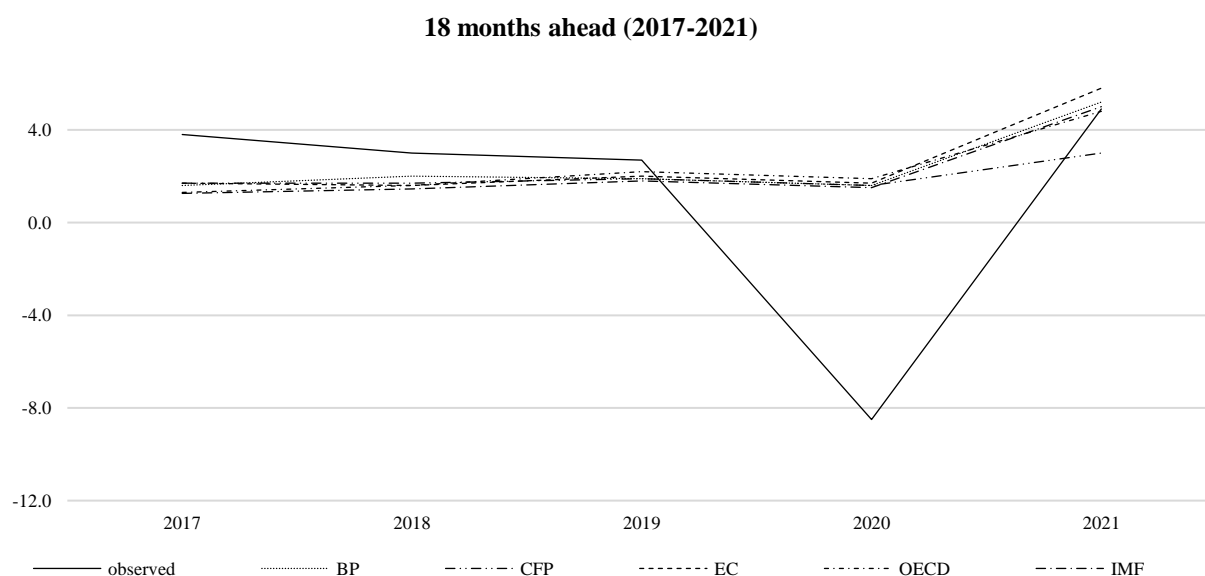


**Figure 12. GDP growth 6 months ahead forecasts (real outcomes and institutions) - shorter period**





**Figure 13. GDP growth 1 year ahead forecasts (real outcomes and institutions) - shorter period**



**Figure 14. GDP growth 18 months ahead forecasts (real outcomes and institutions) - shorter period**

Table 11 provides the mean error for the various institutions and forecast horizons, indicating that for the current year and 6 months ahead forecasts, the ME has a positive sign, implying that, all the institutions are, on average, overpredicting GDP growth while for the 1 year ahead and 18 months ahead forecasts, the ME has a negative sign, expressing the opposite, an underprediction of GDP growth. These results are aligned with the longer period results.

**Table 11. GDP growth forecasts – ME – shorter period**

	2016-2021		2017-2021	
	Current year	6 months ahead	1 year ahead	18 months ahead
<b>BP</b>	0.600	0.850	-1.040	-1.280
<b>CFP</b>	0.833	0.867	-1.180	-0.800
<b>MF</b>	0.650	-	-1.460	-
<b>EC</b>	0.883	0.633	-1.260	-1.380
<b>OECD</b>	0.650	1.417	-0.640	-1.180
<b>IMF</b>	1.008	0.847	-1.420	-1.023

Notes: results in percentage points.

Table 12 summarizes all the information regarding MAE and RMSE in terms of forecast horizons and institutions.

Regarding current year forecasts, the MF is the institution with the lowest values (MAE=0.650 p.p.; RMSE= 0.795 p.p.), while the IMF has the highest values (MAE= 1.008 p.p.; RMSE= 1.077 p.p.). For the 6 months ahead forecasts, BP seems to be the most accurate with MAE and RMSE lower than 1 p.p., while OECD presents a MAE of 1.416 p.p. and a RMSE of 1.572 p.p.. IMF, surprisingly, shows up at the second-best position. Considering the 1 year ahead forecasts, CFP and MF present the lowest values for the MAE (2.900 p.p), while OECD is the least accurate, making, on average, an error of 3.480 p.p.. For 18 months ahead forecasts, the BP is the best institution, while CFP presents the worst value for the MAE (3.240 p.p.) and OECD the worst RMSE (4.830 p.p.).

The magnitude of the summary statistics is bigger for this period than for the longer period studied previously, particularly for the 1 year ahead and 18 months ahead due to the event of the covid 19 pandemic, that caused a massive decrease in GDP growth that was unexpected.

**Table 12. GDP growth forecasts – MAE and RMSE - from best (1) to worst (6) - shorter period**

	Current year		6 months ahead		1 year ahead		18 months ahead	
	MAE	RMSE	MAE	RMSE	MAE	RMSE	MAE	RMSE
1	0.650 (MF)	0.795 (MF)	0.850 (BP)	0.930 (BP)	2.900 (CFP/MF)*	4.728 (CFP)	2.880 (BP)	4.660 (BP)
2	0.683 (OECD)	0.811 (OECD)	1.013 (IMF)	1.133 (IMF)	3.020 (EC)	4.735 (BP)	2.980 (OECD)	4.683 (IMF)
3	0.733 (BP)	0.829 (BP)	1.200 (CFP/EC)*	1.292 (EC)	3.040 (BP)	4.747 (EC)	3.017 (IMF)	4.726 (EC)
4	0.833 (CFP)	0.900 (CFP)	1.417 (OECD)	1.303 (CFP)	3.260 (IMF)	4.769 (IMF)	3.060 (EC)	4.740 (CFP)
5	0.883 (EC)	0.943 (EC)		1.572 (OECD)	3.480 (OECD)	4.787 (MF)	3.240 (CFP)	4.830 (OECD)
6	1.008 (IMF)	1.077 (IMF)				4.979 (OECD)		

Notes: results in percentage points.

\* same value.

Considering the small number of observations, the results are not consistent among forecast horizons. For the current year, MF is the best institution, while BP, usually the institution with better predictions, is only in the third position. CFP forecasts were included in this period, but the results differ depending on the forecast horizon.

- **Unbiasedness and efficiency**

The Breusch-Godfrey test was performed to see if there is no serial correlation of any order up to 3 lags, for all the forecasts horizons and institutions. However, according to Table A.10, a correction of the standard errors was needed considering the rejection of the null hypothesis in some situations. The results regarding the unbiasedness and efficiency tests are summarized in detail in Table A.11.

For the current year, at 5% significance level, the null hypothesis is rejected for all institutions, excluding BP, which is only rejected at 10% significance level. In this sense, these institutions are, on average, overpredicting GDP growth in the period 2016-2021. For 6 months ahead, BP (p-value=0.004) and OECD (p-value=0.006) forecasts have a positive bias, since the null hypothesis is rejected, at 5% significance level. For the other forecast horizons, the null hypothesis is not rejected at any significance level, suggesting that the forecasts are all unbiased.

Regarding efficiency tests, the results showed that the joint hypothesis for the current year, is rejected, at 5% significance level, for CFP (p-value=0.0191), EC (p-value=0.0146), and IMF

(p-value=0.0041) forecasts. In these cases, the (strong) efficiency is not holding. For the 6 months ahead, forecasts are also not (strong) efficient. For the other forecasts horizons, the joint hypothesis is not rejected at any significance level, which is consistent with the hypothesis of (strong) efficiency.

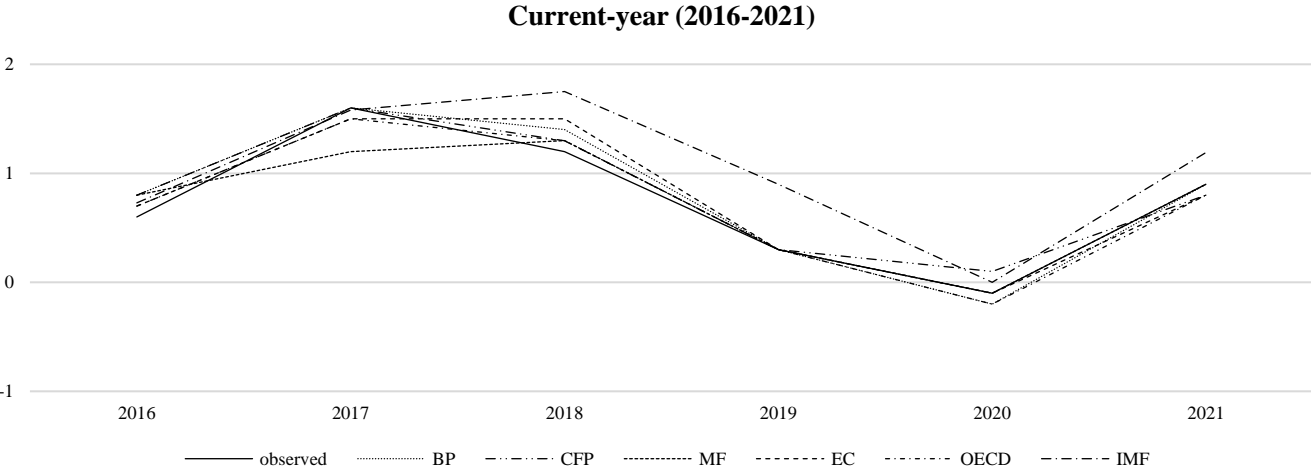
- **Assessing the accuracy**

The results<sup>23</sup>, regarding inflation, suggest that all institutions have the same relative statistical accuracy.

### 4.2.2 Inflation

- **Accuracy**

As in the case of GDP growth, it is important to have, first, an overview of the forecast errors. Figure 15 illustrates the forecast errors of each institution for the current year, figure 16 for 6 months ahead, figure 17 for 1 year ahead, and figure 18 for 18 months ahead. The inflation forecasts are closer to the real observed values for the current year, and more distant in the horizon of 18 months ahead.



**Figure 15. Inflation current year forecasts (real outcomes and institutions) - shorter period**

<sup>23</sup> See Table A.12 and A.13 in appendix for more details.

6 months ahead (2016-2021)

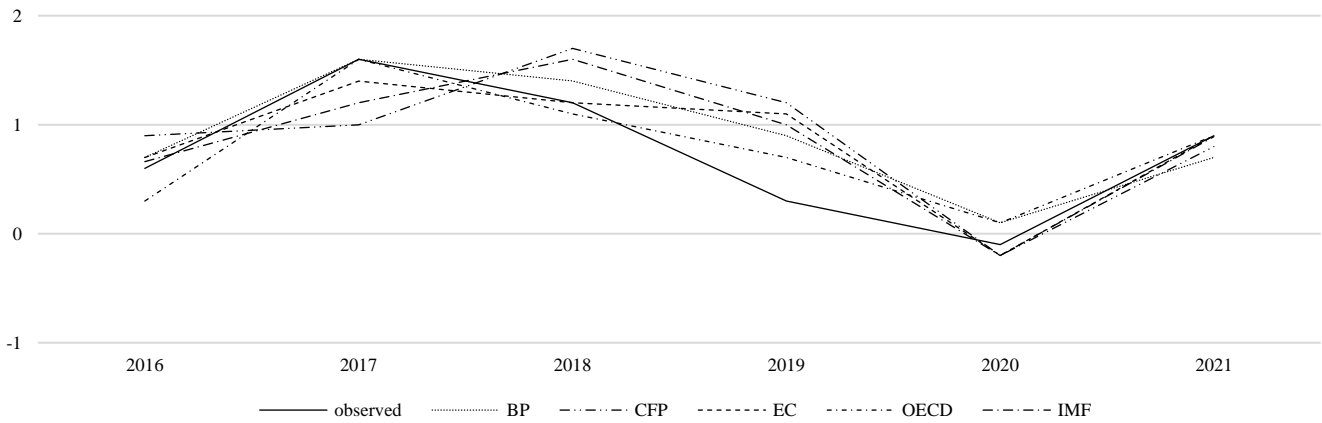


Figure 16. Inflation 6 months ahead forecasts (real outcomes and institutions) - shorter period

1 year ahead (2017-2021)

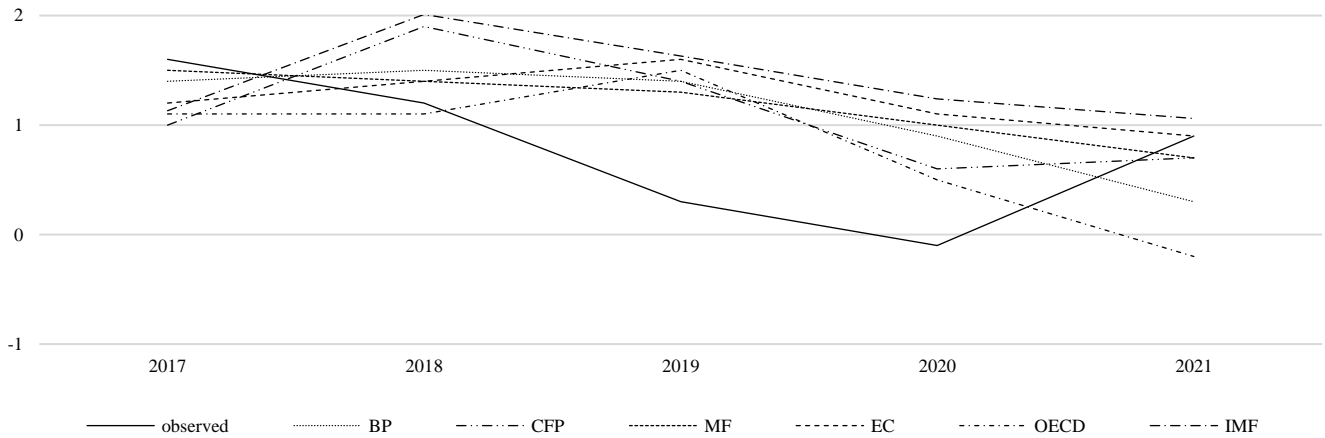


Figure 17. Inflation 1 year ahead forecasts (real outcomes and institutions) - shorter period

18 months ahead (2017-2021)

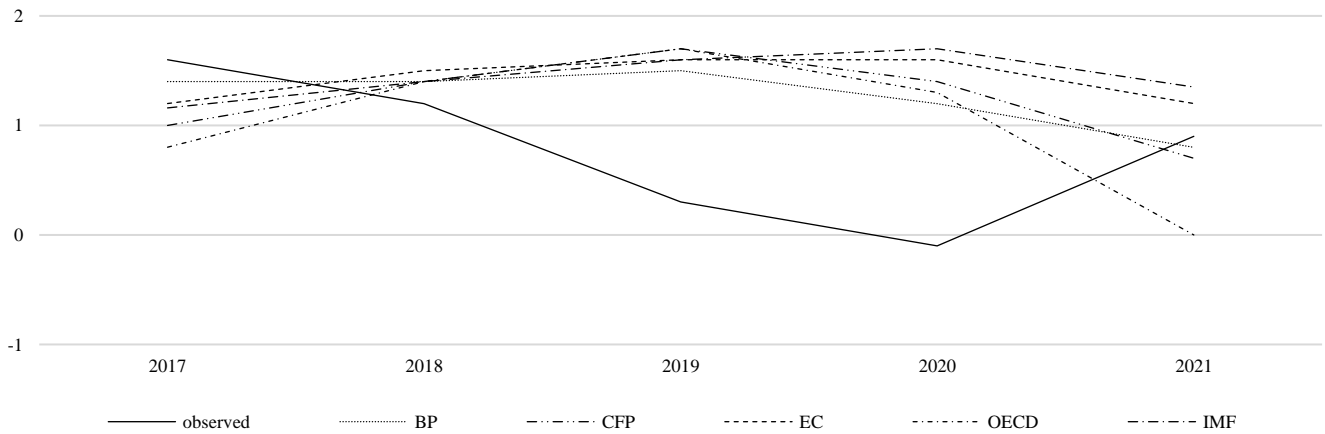


Figure 18. Inflation 18 months ahead forecasts (real outcomes and institutions) - shorter period

The ME for the current year suggests that the majority of institutions are pessimistic, according to Table 13. These results are consistent to the conclusions for the longer period.

**Table 13. Inflation forecasts – ME – shorter period**

	2016-2021		2017-2021	
	Current year	6 months ahead	1 year ahead	18 months ahead
<b>BP</b>	-0.050	-0.150	-0.320	-0.480
<b>CFP</b>	-0.067	-0.150	-0.340	-0.460
<b>MF</b>	0.017		-0.400	
<b>EC</b>	-0.033	-0.100	-0.460	-0.640
<b>OECD</b>	0.017	-0.033	-0.020	-0.260
<b>IMF</b>	-0.275	-0.108	-0.634	-0.662

Notes: results in percentage points.

The following Table 14 ranks the institutions from best to worst, taking into account the summary statistics (MAE and RMSE), and the respective forecast horizons.

The results for the current year suggest that BP and OECD are the two institutions with the lowest MAE (0.083 p.p.), and in terms of RMSE, the OECD is the institution with the lowest value (0.091 p.p.), followed by BP (0.122 p.p.). IMF has the highest values in both measures for a significance margin (MAE=0.282 p.p.; RMSE=0.359 p.p.). For 6 months ahead, the OECD is considered the most accurate institution (MAE=0.167 p.p.; RMSE=0.224 p.p.), while CFP occupies the last position followed by IMF. Considering 1 year ahead forecasts, MF is the most accurate (MAE=0.520 p.p.; RMSE=0.678 p.p.), and IMF the least accurate (MAE=0.822 p.p.; RMSE=0.945 p.p.). BP, for the 18 months ahead, presents the lowest values while OECD the highest, followed by IMF.

Comparing the magnitude of the MAE and RMSE to the longer period, it seems that it is almost similar, but relatively higher for the shorter period..

**Table 14. Inflation forecasts – MAE and RMSE - from best (1) to worst (6) - shorter period**

	Current year		6 months ahead		1 year ahead		18 months ahead	
	MAE	RMSE	MAE	RMSE	MAE	RMSE	MAE	RMSE
1	0.083 (BP/OECD)*	0.091 (OECD)	0.167 (OECD)	0.224 (OECD)	0.520 (MF)	0.678 (MF)	0.600 (BP)	0.802 (BP)
2	0.100 (CFP/EC)*	0.122 (BP)	0.200 (EC)	0.286 (BP)	0.620 (EC)	0.720 (CFP)	0.780 (CFP)	0.964 (CFP)
3	0.117 (MF)	0.129 (CFP)	0.217 (BP)	0.342 (EC)	0.640 (BP)	0.735 (BP)	0.800 (EC)	0.992 (EC)
4	0.282 (IMF)	0.141 (EC)	0.278 (IMF)	0.371 (IMF)	0.660 (CFP)	0.809 (OECD)	0.838 (IMF)	1.036 (IMF)
5		0.187 (MF)	0.417 (CFP)	0.505 (CFP)	0.700 (OECD)	0.816 (EC)	0.940 (OECD)	1.040 (OECD)
6		0.359 (IMF)			0.822 (IMF)	0.945 (IMF)		

Notes: results in percentage points.

\* Same value.

The results suggest that the first position is now occupied by other institutions rather than only BP. Due to the lack of observations, it is hard to take conclusions with certainty because there is not a pattern defined in the rankings.

- **Unbiasedness and efficiency**

Once again, the Breusch-Godfrey test was executed, and the results are presented in detail in Table A.14. The Newey and West procedure was needed to correct the standard errors and the results regarding the unbiasedness and efficiency tests are summarized in detail in Table A.15.

For the current year, at 5% significance level, all the institutions have unbiased forecasts, excluding IMF (p-value=0.045) forecasts, in which the null hypothesis is rejected at 5% significance level. Regarding the other forecast horizons, the null hypothesis is not rejected at any significance level, suggesting that the forecasts are all unbiased.

Regarding efficiency tests, the results showed that the joint hypothesis for the current year and 6 months ahead is not rejected at any significance level, which is consistent with the hypothesis of (strong) efficiency. About the other two forecast horizons, the joint hypothesis is rejected, at 5% significance level, for OECD (p-value=0.0346) and IMF (p-value=0.0274) for 1 year ahead and for CFP (p-value=0.0096), OECD (p-value=0.0081), and IMF (p-

value=0.0034) for 18 months ahead. In these cases, the hypothesis of (strong) efficiency is not holding, indicating that these projections can be improved.

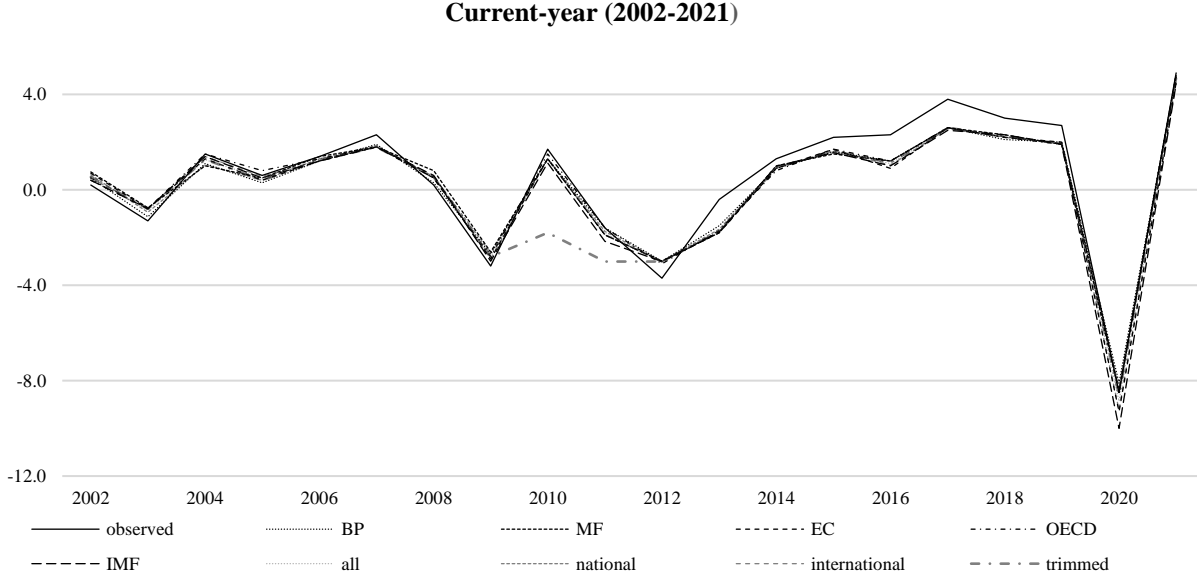
- **Assessing the accuracy**

According to the results<sup>24</sup>, as in the case of GDP growth, all the institutions have the same statistical relative accuracy.

### 4.3 Forecast combination

#### 4.3.1 GDP growth

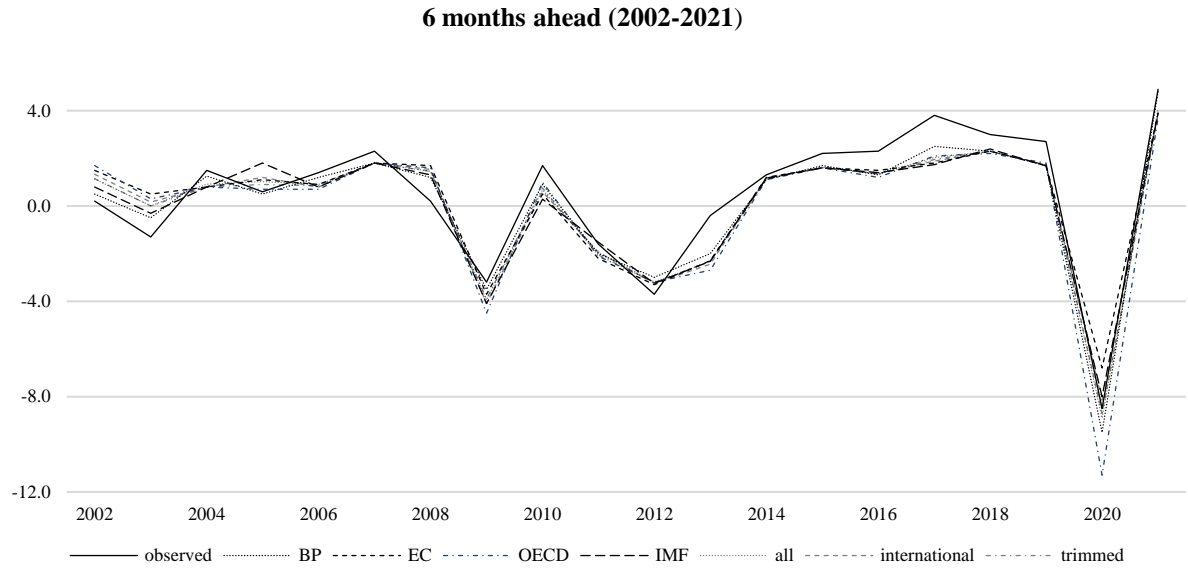
The following figures provide a general overview of the forecast errors over time of both institutions and combined forecasts. Figure 19 illustrates the forecast errors for the current year, figure 20 for 6 months ahead, figure 21 for 1 year ahead, and figure 22 for 18 months ahead. The difference across institutions and combined forecasts is not visible at first..



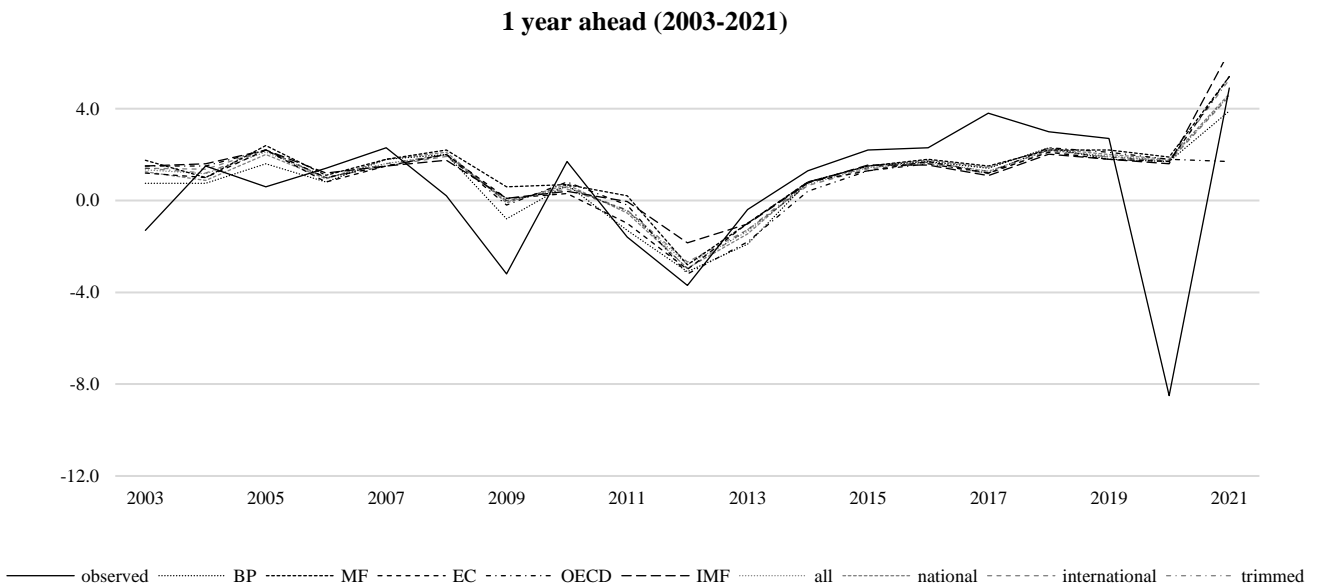
**Figure 19. GDP growth current year forecasts (real outcomes, institutions and combined forecasts)**

<sup>24</sup> See Table A.20 and A.21 in the appendix for more details.

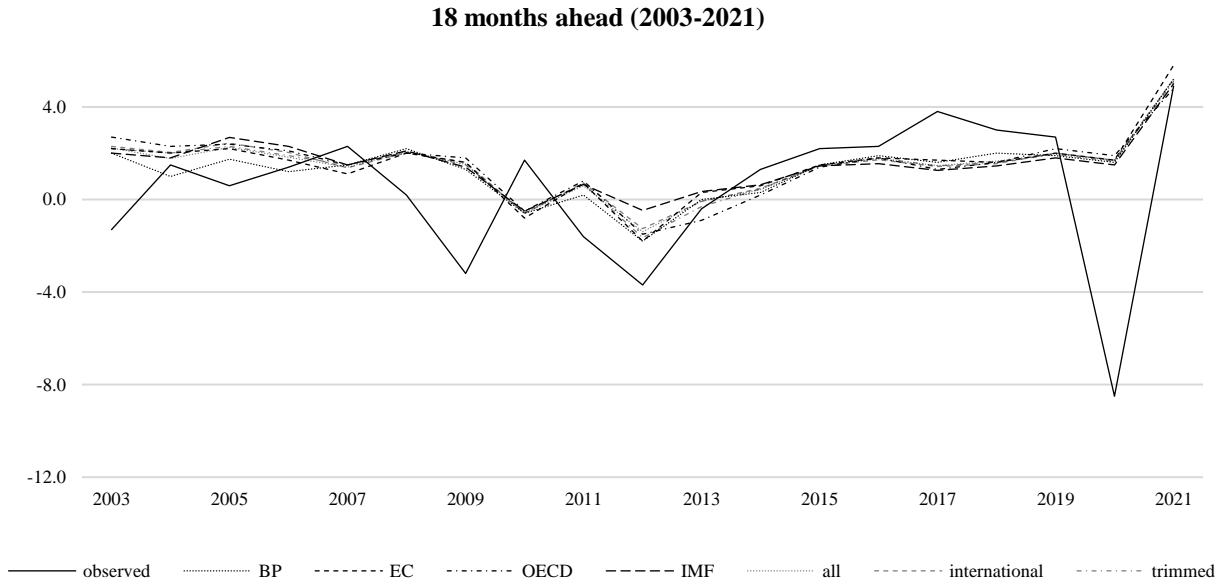




**Figure 20. GDP growth 6 months ahead forecasts (real outcomes, institutions and combined forecasts)**



**Figure 21. GDP growth 1 year ahead forecasts (real outcomes, institutions and combined forecasts)**



**Figure 22. GDP growth 18 months ahead forecasts (real outcomes, institutions and combined forecasts)**

Considering the results in Table 15, for the current year, the trimmed forecast is the worst combination, while the other three present better results than MF, EC and IMF individual forecasts, for both measures, however BP and OECD occupy the top positions. For 6 months ahead, EC and OECD dominate the last standings, followed by the combined forecasts of international institutions. The other combined forecasts are slightly better than the IMF's. In terms of MAE, for 1 year ahead, the combined forecast of national, trimmed and all institutions, perform better than the EC, MF, IMF and OECD institutions. In terms of RMSE, there is not much difference. For 18 months ahead, BP is the most accurate, followed by trimmed and the combined of all institutions, depending on the summary statistics.

**Table 15. GDP growth forecasts – MAE and RMSE - from best (1) to worst (9)**

	Current year		6 months ahead		1 year ahead		18 months ahead	
	MAE	RMSE	MAE	RMSE	MAE	RMSE	MAE	RMSE
1	0.470 (OECD)	0.605 (BP)	0.638 (BP)	0.759 (BP)	1.553 (BP)	2.639 (BP)	1.861 (BP)	2.901 (BP)
2	0.499 (BP)	0.607 (OECD)	0.821 (All)	0.936 (All)	1.604 (National)	2.715 (National)	1.955 (Trimmed)	2.981 (Trimmed)
3	0.527 (National)	0.627 (National)	0.833 (Trimmed)	0.951 (Trimmed)	1.646 (Trimmed)	2.728 (All)	1.975 (All)	2.996 (All)
4	0.532 (All)	0.636 (All)	0.864 (IMF)	0.997 (IMF)	1.647 (All)	2.729 (EC)	2.016 (EC)	3.004 (EC)
5	0.548 (International)	0.661 (International)	0.885 (International)	1.018 (International)	1.658 (EC)	2.732 (Trimmed)	2.038 (International)	3.023 (IMF)
6	0.555 (MF)	0.667 (MF)	0.965 (EC)	1.110 (EC)	1.676 (International)	2.739 (International)	2.079 (OECD)	3.034 (International)
7	0.585 (EC)	0.689 (EC)	1.055 (OECD)	1.249 (OECD)	1.708 (MF)	2.784 (IMF)	2.083 (IMF)	3.109 (OECD)
8	0.620 (IMF)	0.750 (IMF)			1.785 (IMF)	2.834 (MF)		
9	0.738 (Trimmed)	1.050 (Trimmed)			1.816 (OECD)	2.851 (OECD)		

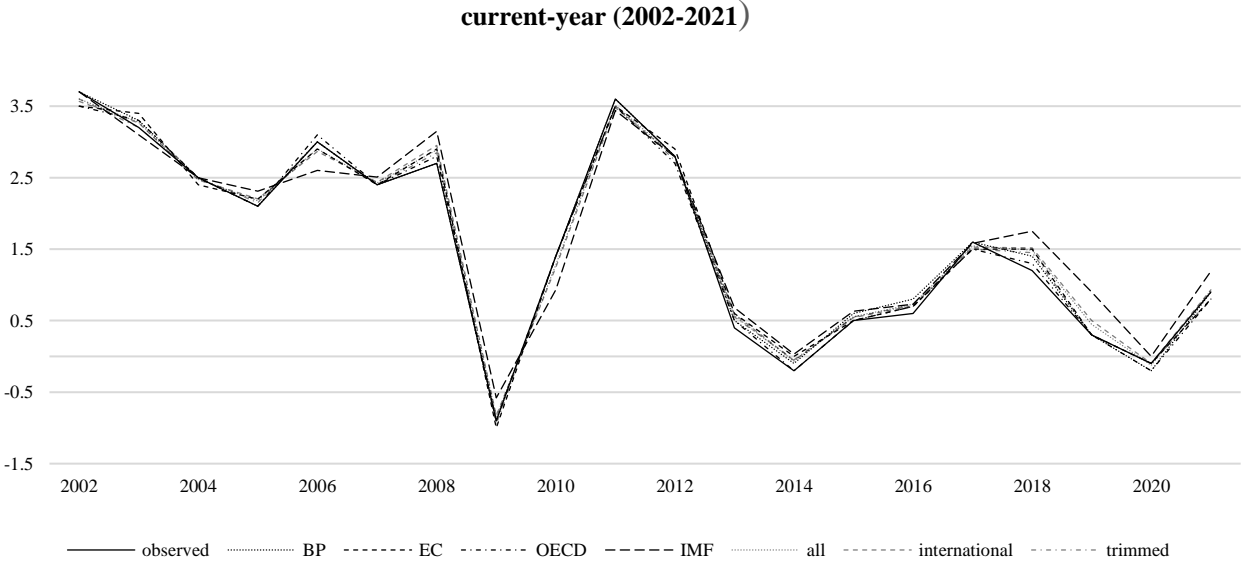
To sum up, in general, BP is considered the institution with GDP growth forecasts closer to the real observed values. The last position is sometimes occupied by IMF, OECD or even by the trimmed forecast, namely for the current year forecasts. The performance of the combination of all institutions, in general, is good, performing better than MF, EC, IMF and OECD (except for the current year). The combination of national institutions is also more accurate than the majority of institutions (MF, EC, IMF for the current year, and EC, MF, IMF, OECD for the 1 year ahead) for the current year and 1 year ahead.

In terms of assessing relative accuracy<sup>25</sup> between combined forecast and also between institutions and the combined forecasts, the null hypothesis was never rejected, therefore all have, statistically, the same relative accuracy.

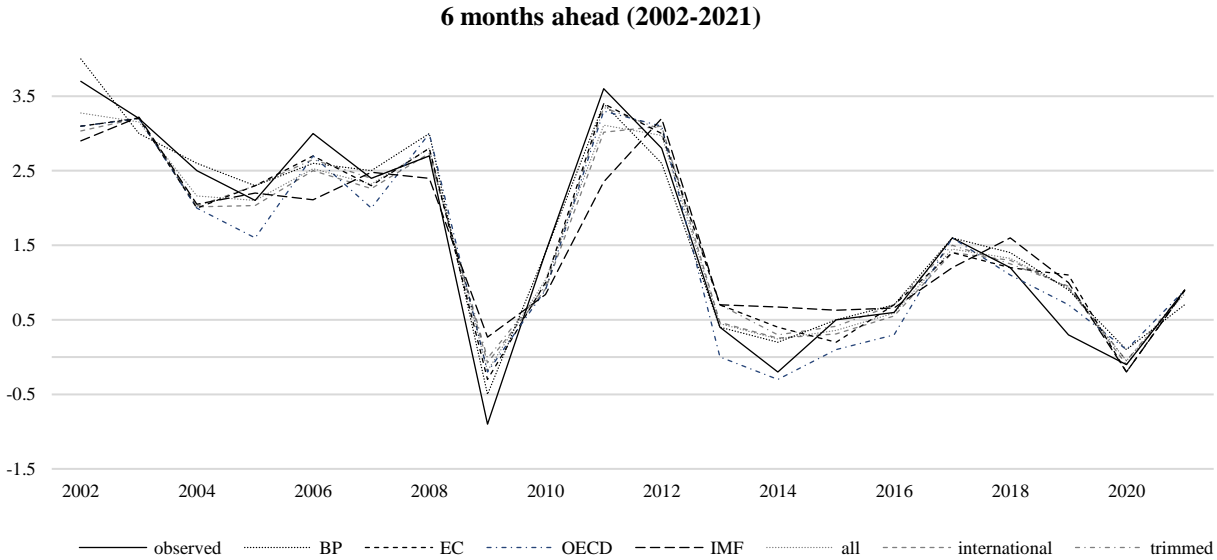
<sup>25</sup> See Table A.23 and A.24 in the appendix for more details.

**4.3.2 Inflation**

As in the case of GDP growth, it is important to have a general overview of the forecast errors over time of both institutions and combined forecasts. Figure 23 illustrates the forecast errors for the current year, figure 24 for 6 months ahead, figure 25 for 1 year ahead, and figure 26 for 18 months ahead.

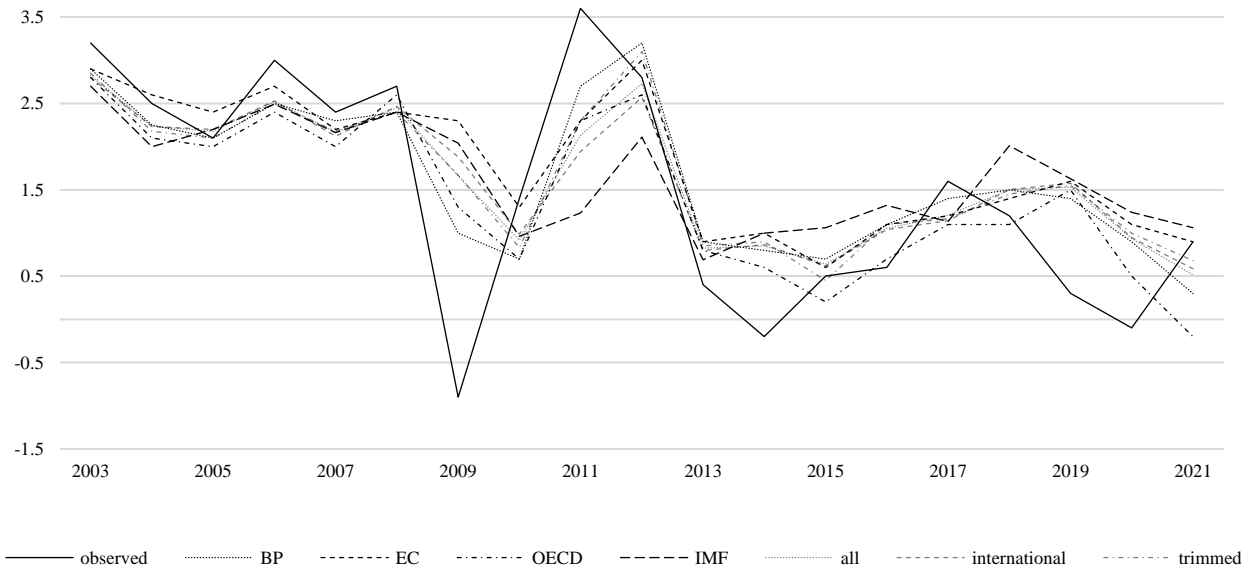


**Figure 23. Inflation current year forecasts (real outcomes, institutions and combined forecasts)**



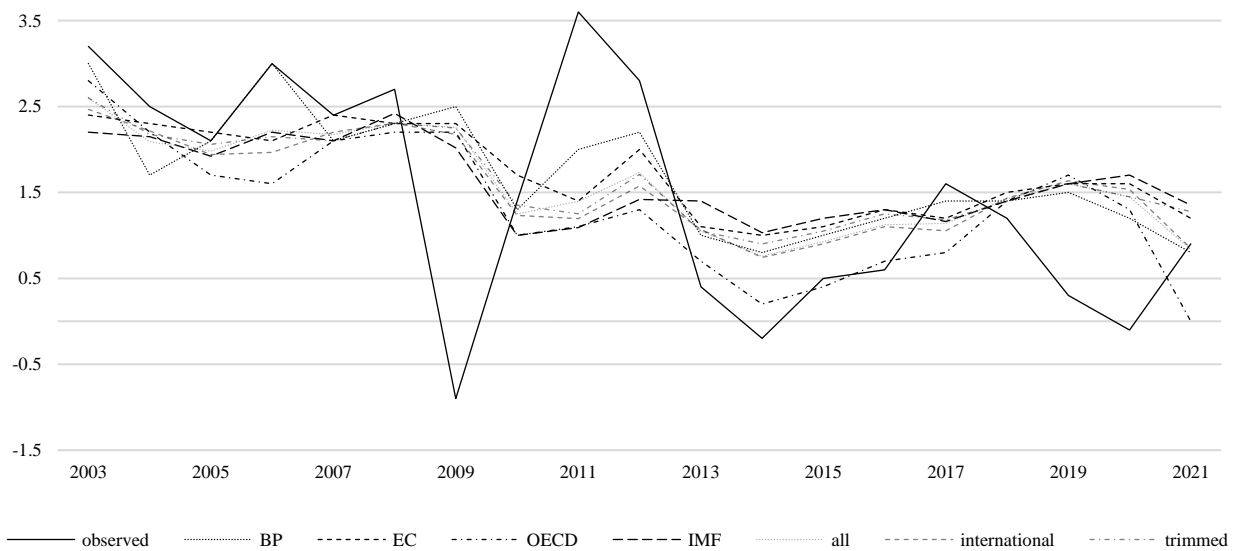
**Figure 24. Inflation 6 months ahead forecasts (real outcomes, institutions and combined forecasts)**

### 1 year ahead (2003-2021)



**Figure 25. Inflation 1 year ahead forecasts (real outcomes, institutions and combined forecasts)**

### 18 months ahead (2003-2021)



**Figure 26. Inflation 18 months ahead forecasts (real outcomes, institutions and combined forecasts)**

The results in Table 12 suggest that, for the current year, in terms of RMSE, the trimmed, the combination of all institutions and the combination of international institutions performed better than EC and IMF forecasts, while BP and OECD occupy the first and second position, respectively. For the case of 6 months ahead, the combination of all institutions is the best at forecasting inflation in terms of RMSE. For 1 year ahead, BP and OECD are on the lead, followed by the combination of all institutions. In terms of RMSE, the trimmed and the combination of international institution performs better than EC and IMF. For 18 months ahead, in terms of the MAE, the combined forecasts appear to be in a better position than forecasts issued from international organizations.

**Table 16. Inflation forecasts – MAE and RMSE - from best (1) to worst (7)**

	Current year		6 months ahead		1 year ahead		18 months ahead	
	MAE	RMSE	MAE	RMSE	MAE	RMSE	MAE	RMSE
1	0.045 (BP)	0.081 (BP)	0.205 (BP)	0.285 (BP)	0.566 (BP)	0.719 (BP)	0.689 (BP)	1.042 (BP)
2	0.065 (OECD)	0.087 (OECD)	0.243 (All)	0.324 (All)	0.605 (OECD)	0.798 (OECD)	0.803 (All)	1.112 (All)
3	0.071 (Trimmed)	0.098 (Trimmed)	0.266 (Trimmed)	1.361 (EC)	0.614 (All)	0.858 (All)	0.839 (Trimmed)	1.144 (Trimmed)
4	0.095 (All)	0.116 (All)	0.280 (EC)	0.364 (Trimmed)	0.616 (EC)	0.861 (Trimmed)	0.841 (International)	1.151 (EC)
5	0.110 (EC)	0.138 (International)	0.289 (International)	0.371 (OECD)	0.621 (Trimmed)	0.915 (International)	0.847 (EC)	1.152 (International)
6	0.111 (International)	0.138 (EC)	0.315 (OECD)	0.387 (International)	0.645 (International)	0.964 (EC)	0.863 (OECD)	1.185 (OECD)
7	0.228 (IMF)	0.292 (IMF)	0.450 (IMF)	0.585 (IMF)	0.814 (IMF)	1.092 (IMF)	0.944 (IMF)	1.208 (IMF)

Summing up, from all institutions and combinations, IMF is still the institution with least accurate forecasts, occupying the last position in every forecast horizon and in both statistics measures. The combination that performs better is the combination of all institutions, dominating for 6 months ahead, in terms of RMSE. The other combinations, in some cases, are more accurate than OECD, and of course, IMF.

Considering the results<sup>26</sup> of the Diebold Mariano test statistics and the modified version, both combined forecasts and institutions have the same relative accuracy to forecast the variable inflation.

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<sup>26</sup> See Table A.26 and A.27 in the appendix for more details





## 5. Conclusion

The present dissertation has mainly two goals: to evaluate the accuracy of macroeconomic variables forecasts issued for Portugal from various institutions, national and international, considering two time periods and to combine the forecasts in several ways to assess whether the accuracy can improve.

The main questions that this study pretends to answer are the following: which institution is the best at forecasting each variable for a given forecast horizon? And does combining forecasts result in better accuracy?

Regarding the longer period of 2002-2021, the BP is considered the best institution to forecast GDP growth which can be related to the fact that from all institutions analysed, BP is the institution that releases its projections later than others. Depending on the forecast horizon, IMF or OECD are considered the least accurate institutions. In the case of inflation forecasts, BP is considered, once again, the most accurate institution to forecast inflation for all forecast horizons while IMF the least accurate.

About the shorter period of 2016-2021, the results are more inconsistent throughout the forecast horizons and due to the small sample size, the conclusions must be analysed with caution. According to MAE and RMSE, in most forecast horizons, BP seems the institution providing more accurate forecasts, however it is not as clear as in the longer period. The same inconsistency occurs with inflation forecasts results.

In terms of unbiasedness, for the longer period, in most cases, the forecasts are unbiased. For the current year and 6 months ahead, in some situations where the null hypothesis of unbiasedness is rejected, institutions tend to overestimate GDP growth, while for the longer horizons, the null hypothesis is not rejected, implying that forecasts are unbiased. In the case of inflation, only for 6 months ahead and 1 year ahead, there are cases where institutions tend to underestimate inflation, while for the remaining horizons, the forecasts are unbiased.

Regarding efficiency, for the longer period, the majority of forecasts are efficient, but as in the case of unbiasedness, there are exceptions where it is possible to improve the projections, especially for the same horizons in which the null hypothesis for unbiased is rejected.

For the shorter period, in the case of GDP growth, the null hypothesis of unbiasedness is rejected mainly for the current year and 6 months ahead, indicating that these forecasts are overpredicting growth. For inflation, there is only one case where the null hypothesis is rejected for the current year. In terms of efficiency, GDP growth forecasts are not efficient for shorter

horizons, but inflation forecasts are, at most, efficient with only few exceptions for 1 year ahead and 18 months ahead.

The difference in accuracy between institutions was also assessed for both longer and shorter period, using the DM test and a modified version of it, however the results showed no significance differences. In other words, no institution proved to perform better than any other according to the test, although there were differences in terms of accuracy (MAE and RMSE).

Comparing the results of the two variables, the accuracy, measured by the MAE and RMSE, is higher for the inflation than for GDP growth forecasts, indicating that institutions make fewer mistakes when forecasting inflation than economic growth. In the case of the shorter period, the magnitude of the summary statistics is superior, namely in the case of GDP growth, especially for the 1 year and 18 months ahead, but it can be related to the COVID-19 pandemic that was not anticipated.

Common to both variables and time periods is that accuracy of forecasts increases as the forecast horizons shortens, which is expected considering that more information is available to the forecaster and uncertainty is lower for shorter horizons.

According to the literature, the results obtained in this Dissertation are, in general, aligned: institutions are more accurate when forecasting inflation than GDP growth, making fewer errors. Regarding studies that included Portugal, BP forecasts are better than other institutions' projections. In terms of relative accuracy, usually, studies show no significant difference in accuracy between the forecasts from the various institutions which confirms the present analysis. Considering unbiasedness and efficiency, it seems that the results were different in the sense that, in the literature, the findings suggest that for the shorter horizons, the forecasts are, usually, unbiased and efficient while for longer horizons, they tend to be biased and more inefficient.

Comparing studies made for other countries, the performance of international organizations is almost identical, although, depending on the forecast horizon, there are situations where OECD is more accurate than EC and EC more accurate than IMF or vice versa. As this being said, there is not a pattern among countries, and no institution is better than other, it depends on the country, variable and forecast horizon investigated.

Regarding combined forecasts, the combination of all institutions, probably the most relevant combination to the analysis, performed better than MF, EC, IMF and OECD (except for the current year) in the case of GDP growth forecasts. Turning to inflation forecasts, a similar interpretation can be taken: the combination of all institutions is more accurate than the forecasts issued by international organizations, individually.

One of the limitations of this dissertation was the small number of observations of the sample (20, at most, for the longer period; and 6, at most, for the shorter period), which may have had implications in the results. As mentioned, in the longer period, the results turned out to be much more consistent compared to the results for the shorter period. In addition to this, the moment each institution announces the forecasts is different among them, which could have implications in the results as well.

In terms of combined forecasts, this dissertation identified that combining forecasts may result in improved accuracy, which can lead to further analyses, considering the gaps in the literature of the Portuguese case.



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## 7. Appendix

**Table A 1. Data availability**

	GDP growth				Inflation			
	current year	6 months ahead	1 year ahead	18 months ahead	current year	6 months ahead	1 year ahead	18 months ahead
<b>BP</b>	1998-2021	2000-2021	2001-2021	2002-2021	2000-2021	2001-2021	2001-2021	2002-2021
<b>CFP</b>	2015-2021	2015-2021	2016-2021	2016-2021	2016-2021	2016-2021	2017-2021	2017-2021
<b>MF</b>	1998-2021	-	1998-2021	-	2006-2021	-	2007-2021	-
<b>EC</b>	2000-2021	2000-2021	2000-2021	2000-2021	2000-2021	2000-2021	2001-2021	2001-2021
<b>OECD</b>	1998-2021	1999-2021	1999-2021	2000-2022	2002-2021	2002-2021	2003-2021	2003-2021
<b>IMF</b>	1998-2022	1998-2021	1998-2021	1998-2022	1998-2021	1998-2021	1998-2021	1998-2021

**Table A 2. GDP growth - test for no serial autocorrelation – p-values of the Breusch Godfrey (longer period)**

	Current year								6 months ahead							
	unbiasedness				efficiency				unbiasedness				efficiency			
	Lag 1	Lag 2	Lag 3	Lag 4	Lag 1	Lag 2	Lag 3	Lag 4	Lag 1	Lag 2	Lag 3	Lag 4	Lag 1	Lag 2	Lag 3	Lag 4
<b>BP</b>	0.208	0.446	0.476	0.278	0.400	0.560	0.474	0.537	0.718	0.874	0.514	0.499	0.667	0.856	0.505	0.527
<b>CFP</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>MF</b>	0.387	0.589	0.391	0.494	0.492	0.588	0.346	0.505	-	-	-	-	-	-	-	-
<b>EC</b>	0.214	0.385	0.192	0.286	0.256	0.414	0.198	0.319	0.884	0.954	0.987	0.973	0.851	0.894	0.944	0.947
<b>OECD</b>	0.100	0.226	0.218	0.223	0.113	0.211	0.178	0.263	0.532	0.779	0.657	0.614	0.347	0.614	0.561	0.635
<b>IMF</b>	0.290	0.397	0.158	0.244	0.230	0.358	0.156	0.256	0.644	0.897	0.541	0.503	0.700	0.928	0.325	0.325
	1 year ahead								18 months ahead							
	unbiasedness				efficiency				unbiasedness				efficiency			
	Lag 1	Lag 2	Lag 3	Lag 4	Lag 1	Lag 2	Lag 3	Lag 4	Lag 1	Lag 2	Lag 3	Lag 4	Lag 1	Lag 2	Lag 3	Lag 4
<b>BP</b>	0.516	0.788	0.554	0.715	0.488	0.767	0.506	0.618	0.630	0.708	0.768	0.878	0.563	0.684	0.744	0.846
<b>CFP</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>MF</b>	0.811	0.948	0.797	0.884	0.699	0.898	0.748	0.775	-	-	-	-	-	-	-	-
<b>EC</b>	0.836	0.906	0.664	0.806	0.706	0.852	0.609	0.710	0.763	0.722	0.833	0.909	0.614	0.694	0.820	0.888
<b>OECD</b>	0.266	0.537	0.558	0.722	0.234	0.491	0.481	0.626	0.717	0.831	0.941	0.982	0.512	0.724	0.871	0.937
<b>IMF</b>	0.886	0.889	0.763	0.849	1.000	0.888	0.745	0.767	0.719	0.743	0.894	0.953	0.654	0.738	0.889	0.949

**Table A 3. GDP growth - tests for unbiasedness and efficiency (longer period)**

	Current year			6 months ahead		
	Test for unbiasedness		Test for efficiency	Test for unbiasedness		Test for efficiency
	$\alpha$	$\alpha = 0$	$\alpha = 0, \beta = 1$	$\alpha$	$\alpha = 0$	$\alpha = 0, \beta = 1$
<b>BP</b>	0.281	0.034	0.0043	0.358	0.031	0.1004
<b>CFP</b>	-	-	-	-	-	-
<b>MF</b>	0.255	0.087	0.0974	-	-	-
<b>EC</b>	0.355	0.017	0.0543	0.245	0.336	0.3444
<b>OECD</b>	0.24	0.076	0.0561	0.545	0.048	0.0249
<b>IMF</b>	0.421	0.008	0.0310	0.37	0.098	0.2035

	1 year ahead			18 months ahead		
	Test for unbiasedness		Test for efficiency	Test for unbiasedness		Test for efficiency
	$\alpha$	$\alpha = 0$	$\alpha = 0, \beta = 1$	$\alpha$	$\alpha = 0$	$\alpha = 0, \beta = 1$
<b>BP</b>	-0.379	0.546	0.8366	-0.818	0.228	0.4841
<b>CFP</b>	-	-	-	-	-	-
<b>MF</b>	-0.845	0.202	0.4396	-	-	-
<b>EC</b>	-0.574	0.374	0.6596	-0.984	0.158	0.3431
<b>OECD</b>	-0.437	0.519	0.7748	-0.984	0.174	0.3196
<b>IMF</b>	-0.789	0.226	0.4784	1.014	0.148	0.3589

Notes: p-values below or equal to 0.05 (0.1) are shaded in dark grey (light grey) and indicate rejection of the null hypothesis at a significance level of 5% (10%).

**Table A 4. GDP growth – Diebold Mariano test statistics (longer period)**

**2002-2021**

	<b>Current year</b>						<b>6 months ahead</b>						
	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>	
<b>BP</b>	-	-	-0.362	-0.409	-0.016	-0.391	<b>BP</b>	-	-	-	-0.750	-0.603	-0.552
<b>CFP</b>	-	-	-	-	-	-	<b>CFP</b>	-	-	-	-	-	-
<b>MF</b>	0.362	-	-	-0.113	0.562	-0.217	<b>MF</b>	-	-	-	-	-	-
<b>EC</b>	0.409	-	0.113	-	0.471	-0.227	<b>EC</b>	0.750	-	-	-	-0.258	0.259
<b>OECD</b>	0.016	-	-0.562	-0.471	-	-0.379	<b>OECD</b>	0.603	-	-	0.258	-	0.300
<b>IMF</b>	0.391	-	0.217	0.227	0.379	-	<b>IMF</b>	0.552	-	-	-0.259	-0.300	-

**2003-2021**

	<b>1 year ahead</b>						<b>18 months ahead</b>						
	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>	
<b>BP</b>	-	-	-0.418	-0.346	-0.507	-0.435	<b>BP</b>	-	-	-	-0.631	-0.622	-0.397
<b>CFP</b>	-	-	-	-	-	-	<b>CFP</b>	-	-	-	-	-	-
<b>MF</b>	0.418	-	-	0.367	-0.035	0.138	<b>MF</b>	-	-	-	-	-	-
<b>EC</b>	0.346	-	-0.367	-	-0.279	-0.263	<b>EC</b>	0.631	-	-	-	-0.450	-0.056
<b>OECD</b>	0.507	-	0.035	0.279	-	0.167	<b>OECD</b>	0.622	-	-	0.450	-	0.191
<b>IMF</b>	0.435	-	-0.138	0.263	-0.167	-	<b>IMF</b>	0.397	-	-	0.056	-0.191	-

**Table A 5. GDP growth – version modified of Diebold Mariano - HLN (longer period)**

**2002-2021**

	<b>Current year</b>						<b>6 months ahead</b>						
	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>	
<b>BP</b>	-	-	-0.0790	-0.089	-0.003	-0.085	<b>BP</b>	-	-	-	-0.163	-0.131	-0.120
<b>CFP</b>	-	-	-	-	-	-	<b>CFP</b>	-	-	-	-	-	-
<b>MF</b>	0.079	-	-	-0.0245	0.122	-0.047	<b>MF</b>	-	-	-	-	-	-
<b>EC</b>	0.089	-	0.0245	-	0.103	-0.049	<b>EC</b>	0.163	-	-	-	-0.0562	0.056
<b>OECD</b>	0.003	-	-0.122	-0.103	-	-0.083	<b>OECD</b>	0.131	-	-	0.0562	-	0.065
<b>IMF</b>	0.085	-	0.047	0.049	0.083	-	<b>IMF</b>	0.120	-	-	-0.056	-0.065	-

**2003-2021**

	<b>1 year ahead</b>						<b>18 months ahead</b>						
	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>	
<b>BP</b>	-	-	-0.093	-0.077	-0.113	-0.097	<b>BP</b>	-	-	-	-0.141	-0.139	-0.089
<b>CFP</b>	-	-	-	-	-	-	<b>CFP</b>	-	-	-	-	-	-
<b>MF</b>	0.093	-	-	0.082	-0.008	0.031	<b>MF</b>	-	-	-	-	-	-
<b>EC</b>	0.077	-	-0.082	-	-0.062	-0.059	<b>EC</b>	0.141	-	-	-	-0.100	-0.012
<b>OECD</b>	0.113	-	0.008	0.062	-	0.037	<b>OECD</b>	0.139	-	-	0.100	-	0.043
<b>IMF</b>	0.097	-	-0.031	0.059	-0.037	-	<b>IMF</b>	0.089	-	-	0.012	-0.043	-

**Table A 6. Inflation - test for no serial autocorrelation – p-values of the Breusch Godfrey (longer period)**

	Current year								6 months ahead							
	unbiasedness				efficiency				unbiasedness				efficiency			
	Lag 1	Lag 2	Lag 3	Lag 4	Lag 1	Lag 2	Lag 3	Lag 4	Lag 1	Lag 2	Lag 3	Lag 4	Lag 1	Lag 2	Lag 3	Lag 4
<b>BP</b>	0.5426	0.4857	0.6543	0.0545	0.6021	0.5906	0.7455	0.0461	0.7937	0.2042	0.2498	0.2535	0.8424	0.2297	0.3697	0.1993
<b>CFP</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>MF</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>EC</b>	0.1353	0.3092	0.2888	0.4228	0.0624	0.1451	0.1398	0.2049	0.5376	0.8259	0.8060	0.9127	0.0977	0.1113	0.1898	0.0953
<b>OECD</b>	0.3696	0.6498	0.8137	0.5285	0.3481	0.6390	0.7699	0.5101	0.7308	0.8469	0.8495	0.6130	0.8793	0.8334	0.8359	0.5099
<b>IMF</b>	0.3909	0.3170	0.5065	0.5495	0.6963	0.1574	0.2477	0.3869	0.7307	0.8450	0.5545	0.6671	0.1193	0.0497	0.0234	0.0155
	1 year ahead								18 months ahead							
	unbiasedness				efficiency				unbiasedness				efficiency			
	Lag 1	Lag 2	Lag 3	Lag 4	Lag 1	Lag 2	Lag 3	Lag 4	Lag 1	Lag 2	Lag 3	Lag 4	Lag 1	Lag 2	Lag 3	Lag 4
<b>BP</b>	0.8221	0.5364	0.6400	0.7723	0.1100	0.0102	0.0177	0.0239	0.8131	0.1534	0.2440	0.2440	0.9933	0.1360	0.2118	0.3001
<b>CFP</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>MF</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>EC</b>	0.7842	0.1651	0.1426	0.1904	0.5016	0.1225	0.1019	0.1036	0.5119	0.1557	0.2034	0.3298	0.6171	0.1468	0.1508	0.2338
<b>OECD</b>	0.9654	0.0875	0.0915	0.1466	0.7461	0.0499	0.0524	0.0585	0.5580	0.1281	0.1115	0.1977	0.3896	0.1431	0.1823	0.2900
<b>IMF</b>	0.4633	0.2187	0.3166	0.4696	0.5021	0.2258	0.2938	0.4458	0.2562	0.0758	0.1406	0.2360	0.2104	0.0768	0.1440	0.2394

Notes: p-values below or equal to 0.05 (0.1) are shaded in dark grey (light grey) and indicate rejection of the null hypothesis at a significance level of 5% (10%).

**Table A 7. Inflation - tests for unbiasedness and efficiency (longer period)**

	Current year			6 months ahead		
	Test for unbiasedness		Test for efficiency	Test for unbiasedness		Test for efficiency
	$\alpha$	$\alpha = 0$	$\alpha = 0, \beta = 1$	$\alpha$	$\alpha = 0$	$\alpha = 0, \beta = 1$
<b>BP</b>	-0.035	0.101*	0.1376*	-0.085	0.145	0.1298
<b>CFP</b>	-	-	-	-	-	-
<b>MF</b>	-	-	-	-	-	-
<b>EC</b>	-0.03	0.343	0.3365*	-0.01	0.905	0.0023*
<b>OECD</b>	0.005	0.804	0.9046	0.125	0.135	0.2767
<b>IMF</b>	-0.112	0.086	0.1020	0.027	0.845	0.0133*

	1 year ahead			18 months ahead		
	Test for unbiasedness		Test for efficiency	Test for unbiasedness		Test for efficiency
	$\alpha$	$\alpha = 0$	$\alpha = 0, \beta = 1$	$\alpha$	$\alpha = 0$	$\alpha = 0, \beta = 1$
<b>BP</b>	-0.161	0.344	0.0264*	-0.237	0.335	0.5709
<b>CFP</b>	-	-	-	-	-	-
<b>MF</b>	-	-	-	-	-	-
<b>EC</b>	-0.311	0.166	0.3178	-0.247	0.363	0.5981
<b>OECD</b>	0.047	0.648*	0.5866*	0.137	0.628	0.6830
<b>IMF</b>	-0.181	0.486	0.7405	-0.14	0.582*	0.8644*

Notes: p-values below or equal to 0.05 (0.1) are shaded in dark grey (light grey) and indicate rejection of the null hypothesis at a significance level of 5% (10%).

\* p-value when correcting the standard errors.

**Table A 8. Inflation – Diebold Mariano test statistics (longer period)**

**2002-2021**

	<b>Current year</b>						<b>6 months ahead</b>						
	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>	
<b>BP</b>	-	-	-	-0.643	-0.067	-0.733	<b>BP</b>	-	-	-	-0.534	-0.488	-0.637
<b>CFP</b>	-	-	-	-	-	-	<b>CFP</b>	-	-	-	-	-	-
<b>MF</b>	-	-	-	-	-	-	<b>MF</b>	-	-	-	-	-	-
<b>EC</b>	0.643	-	-	-	0.545	-0.634	<b>EC</b>	0.534	-	-	-	-0.047	-0.509
<b>OECD</b>	0.067	-	-	-0.545	-	-0.702	<b>OECD</b>	0.488	-	-	0.047	-	-0.474
<b>IMF</b>	0.733	-	-	0.634	0.702	-	<b>IMF</b>	0.637	-	-	0.509	0.474	-

**2003-2021**

	<b>1 year ahead</b>						<b>18 months ahead</b>						
	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>	
<b>BP</b>	-	-	-	-0.269	-0.271	-0.444	<b>BP</b>	-	-	-	-0.338	-0.267	-0.301
<b>CFP</b>	-	-	-	-	-	-	<b>CFP</b>	-	-	-	-	-	-
<b>MF</b>	-	-	-	-	-	-	<b>MF</b>	-	-	-	-	-	-
<b>EC</b>	0.269	-	-	-	0.223	-0.265	<b>EC</b>	0.338	-	-	-	-0.104	-0.216
<b>OECD</b>	0.271	-	-	-0.223	-	-0.437	<b>OECD</b>	0.267	-	-	0.104	-	-0.078
<b>IMF</b>	0.444	-	-	0.265	0.437	-	<b>IMF</b>	0.301	-	-	0.216	0.078	-



**Table A 9. Inflation - version modified of Diebold Mariano - HLN (longer period)**

**2002-2021**

	<b>Current year</b>						<b>6 months ahead</b>						
	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>	
<b>BP</b>	-	-	-	-0.140	-0.015	-0.160	<b>BP</b>	-	-	-	-0.116	-0.106	-0.139
<b>CFP</b>	-	-	-	-	-	-	<b>CFP</b>	-	-	-	-	-	-
<b>MF</b>	-	-	-	-	-	-	<b>MF</b>	-	-	-	-	-	-
<b>EC</b>	0.140	-	-	-	0.119	-0.138	<b>EC</b>	0.116	-	-	-	-0.0103	-0.111
<b>OECD</b>	0.015	-	-	-0.119	-	-0.153	<b>OECD</b>	0.106	-	-	0.0103	-	-0.103
<b>IMF</b>	0.160	-	-	0.138	0.153	-	<b>IMF</b>	0.139	-	-	0.111	0.103	-

**2003-2021**

	<b>1 year ahead</b>						<b>18 months ahead</b>						
	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>	
<b>BP</b>	-	-	-	-0.060	-0.060	-0.099	<b>BP</b>	-	-	-	-0.075	-0.060	-0.067
<b>CFP</b>	-	-	-	-	-	-	<b>CFP</b>	-	-	-	-	-	-
<b>MF</b>	-	-	-	-	-	-	<b>MF</b>	-	-	-	-	-	-
<b>EC</b>	0.060	-	-	-	0.050	-0.0593	<b>EC</b>	0.075	-	-	-	-0.023	-0.0481
<b>OECD</b>	0.060	-	-	0.050	-	-0.097	<b>OECD</b>	0.060	-	-	0.023	-	-0.017
<b>IMF</b>	0.099	-	-	0.0593	0.097	-	<b>IMF</b>	0.067	-	-	0.0481	0.017	-

**Table A 10. GDP growth - test for no serial autocorrelation – p-values of the Breusch Godfrey (shorter period)**

	Current year						6 months ahead					
	unbiasedness			efficiency			unbiasedness			efficiency		
	Lag 1	Lag 2	Lag 3	Lag 1	Lag 2	Lag 3	Lag 1	Lag 2	Lag 3	Lag 1	Lag 2	Lag 3
<b>BP</b>	0.2177	0.2933	0.2056	0.0760	0.1636	0.2786	0.5038	0.5699	0.6239	0.6439	0.8980	0.4708
<b>CFP</b>	0.3894	0.6764	0.7937	0.1842	0.3927	0.5909	0.3071	0.5752	0.1824	0.1014	0.1333	0.2437
<b>MF</b>	0.2117	0.4469	0.4035	0.1915	0.394	0.4715	-	-	-	-	-	-
<b>EC</b>	0.3018	0.5424	0.7302	0.1955	0.3902	0.5972	0.6566	0.8612	0.1595	0.4590	0.7492	0.1298
<b>OECD</b>	0.1923	0.3797	0.2846	0.1184	0.2582	0.4252	0.3942	0.1009	0.1968	0.3854	0.1153	0.1476
<b>IMF</b>	0.2363	0.288	0.3496	0.4449	0.6596	0.4432	0.6042	0.7569	0.3106	0.3090	0.5189	0.1917
	1 year ahead						18 months ahead					
	unbiasedness			efficiency			unbiasedness			efficiency		
	Lag 1	Lag 2	Lag 3	Lag 1	Lag 2	Lag 3	Lag 1	Lag 2	Lag 3	Lag 1	Lag 2	Lag 3
<b>BP</b>	0.5608	0.7405	0.1718	0.7153	0.9039	0.1718	0.7485	0.6662	0.1726	0.9969	0.6851	0.1718
<b>CFP</b>	0.7041	0.7391	0.1719	0.7856	0.8056	0.1718	0.5142	0.5268	0.1756	0.5427	0.2501	0.1718
<b>MF</b>	0.7756	0.7100	0.1720	0.8431	0.7407	0.1718	-	-	-	-	-	-
<b>EC</b>	0.7790	0.7686	0.1718	0.7054	0.7760	0.1718	0.8760	0.5175	0.1756	0.9396	0.4083	0.1718
<b>OECD</b>	0.3928	0.6492	0.1718	0.3560	0.2696	0.1718	0.7818	0.5722	0.1739	0.6712	0.5358	0.1718
<b>IMF</b>	0.9475	0.7583	0.1720	0.7559	0.7447	0.1718	0.8054	0.5813	0.1740	0.8721	0.5270	0.1718

Notes: p-values below or equal to 0.05 (0.1) are shaded in dark grey (light grey) and indicate rejection of the null hypothesis at a significance level of 5% (10%)

**Table A 11. GDP growth - tests for unbiasedness and efficiency (shorter period)**

	Current year			6 months ahead		
	Test for unbiasedness		Test for efficiency	Test for unbiasedness		Test for efficiency
	$\alpha$	$\alpha = 0$	$\alpha = 0, \beta = 1$	$\alpha$	$\alpha = 0$	$\alpha = 0, \beta = 1$
<b>BP</b>	0.600	0.066	0.1121(*)	0.850	0.004	0.0205
<b>CFP</b>	0.833	0.003	0.0191	0.867	0.103	0.0197
<b>MF</b>	0.650	0.025	0.0699	-	-	-
<b>EC</b>	0.883	0.002	0.0146	0.633	0.264	0.0257
<b>OECD</b>	0.650	0.030	0.0708	1.417	0.006	0.0015
<b>IMF</b>	1.008	0.002	0.0041	0.847	0.054	0.0367

	1 year ahead			18 months ahead		
	Test for unbiasedness		Test for efficiency	Test for unbiasedness		Test for efficiency
	$\alpha$	$\alpha = 0$	$\alpha = 0, \beta = 1$	$\alpha$	$\alpha = 0$	$\alpha = 0, \beta = 1$
<b>BP</b>	-1.040	0.676	0.8566	-1.280	0.598	0.8534
<b>CFP</b>	-1.180	0.633	0.8850	-0.800	0.749	0.7452
<b>MF</b>	-1.460	0.557	0.8515	-	-	-
<b>EC</b>	-1.260	0.611	0.8919	-1.380	0.575	0.8697
<b>OECD</b>	-0.640	0.808	0.9474	-1.180	0.641	0.9094
<b>IMF</b>	-1.420	0.567	0.8685	-1.023	0.678	0.9186

Notes: p-values below or equal to 0.05 (0.1) are shaded in dark grey (light grey) and indicate rejection of the null hypothesis at a significance level of 5% (10%).

\* p-value when correcting the standard errors.

**Table A 12. GDP growth – Diebold Mariano test statistics (shorter period)**

<b>2016-2021</b>													
<b>Current year</b>							<b>6 months ahead</b>						
	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>		<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>
<b>BP</b>	-	-0.400	0.338	-0.582	0.241	-0.567	<b>BP</b>	-	-0.582	-	-0.727	-0.608	-0.352
<b>CFP</b>	0.400	-	0.550	-0.494	0.460	-0.530	<b>CFP</b>	0.582	-	-	0.024	-0.251	0.607
<b>MF</b>	-0.338	-0.550	-	-0.715	-0.440	-0.612	<b>MF</b>	-	-	-	-	-	-
<b>EC</b>	0.582	0.494	0.715	-	0.620	-0.395	<b>EC</b>	0.727	-0.024	-	-	-0.378	0.347
<b>OECD</b>	-0.241	-0.460	0.440	-0.620	-	-0.570	<b>OECD</b>	0.608	0.251	-	0.378	-	0.370
<b>IMF</b>	0.567	0.530	0.612	0.395	0.570	-	<b>IMF</b>	0.352	-0.607	-	-0.347	-0.370	-

<b>2017-2021</b>													
<b>1 year ahead</b>							<b>18 months ahead</b>						
	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>		<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>
<b>BP</b>	-	0.121	-0.243	-0.180	-0.598	-0.218	<b>BP</b>	-	-0.473	-	-0.641	-0.609	-0.150
<b>CFP</b>	-0.121	-	-0.279	-0.874	-0.547	-0.236	<b>CFP</b>	0.473	-	-	0.075	-0.240	0.240
<b>MF</b>	0.243	0.279	-	0.177	-0.397	0.050	<b>MF</b>	-	-	-	-	-	-
<b>EC</b>	0.180	0.874	-0.177	-	-0.507	-0.135	<b>EC</b>	0.641	-0.075	-	-	-0.489	0.180
<b>OECD</b>	0.598	0.547	0.397	0.507	-	0.548	<b>OECD</b>	0.609	0.240	-	0.489	-	0.367
<b>IMF</b>	0.218	0.236	-0.050	0.135	-0.548	-	<b>IMF</b>	0.150	-0.240	-	-0.180	-0.367	-

**Table A 13. GDP growth- version modified of Diebold Mariano - HLN (shorter period)**

<b>2016-2021</b>													
<b>Current year</b>							<b>6 months ahead</b>						
	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>		<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>
<b>BP</b>	-	-0.149	0.126	-0.217	0.090	-0.211	<b>BP</b>	-	-0.217	-	-0.271	-0.227	-0.131
<b>CFP</b>	-0.149	-	0.205	-0.184	0.171	-0.198	<b>CFP</b>	0.217	-	-	0.009	-0.094	0.226
<b>MF</b>	-0.126	-0.205	-	-0.266	-0.164	-0.228	<b>MF</b>	-	-	-	-	-	-
<b>EC</b>	0.217	0.184	0.266	-	0.231	-0.147	<b>EC</b>	0.271	-0.009	-	-	-0.141	0.129
<b>OECD</b>	-0.090	-0.171	0.164	-0.231	-	-0.213	<b>OECD</b>	0.227	0.094	-	0.141	-	0.138
<b>IMF</b>	0.211	0.198	0.228	0.147	0.213	-	<b>IMF</b>	0.131	-0.226	-	-0.129	-0.138	-

<b>2017-2021</b>													
<b>1 year ahead</b>							<b>18 months ahead</b>						
	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>		<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>
<b>BP</b>	-	0.049	-0.097	-0.072	-0.239	-0.087	<b>BP</b>	-	-0.189	-	-0.257	-0.244	-0.060
<b>CFP</b>	-0.049	-	-0.112	-0.350	-0.219	-0.094	<b>CFP</b>	0.189	-	-	0.030	-0.096	0.096
<b>MF</b>	0.097	0.112	-	0.071	-0.159	0.020	<b>MF</b>	-	-	-	-	-	-
<b>EC</b>	0.072	0.350	-0.071	-	-0.203	-0.054	<b>EC</b>	0.257	-0.030	-	-	-0.195	0.072
<b>OECD</b>	0.239	0.219	0.159	0.203	-	0.219	<b>OECD</b>	0.244	0.096	-	0.195	-	0.147
<b>IMF</b>	0.087	0.094	-0.020	0.054	-0.219	-	<b>IMF</b>	0.060	-0.096	-	-0.072	-0.147	-

**Table A 14. Inflation - test for no serial autocorrelation – p-values of the Breusch Godfrey (shorter period)**

	Current year						6 months ahead					
	unbiasedness			efficiency			unbiasedness			efficiency		
	Lag 1	Lag 2	Lag 3	Lag 1	Lag 2	Lag 3	Lag 1	Lag 2	Lag 3	Lag 1	Lag 2	Lag 3
<b>BP</b>	0.8027	0.9589	0.9724	0.1857	0.3448	0.3718	0.8061	0.1203	0.2357	0.5963	0.1118	0.2021
<b>CFP</b>	0.0469	0.1386	0.1877	0.0402	0.1217	0.2101	0.6684	0.2420	0.4099	0.7558	0.2180	0.1874
<b>MF</b>	0.1405	0.2436	0.3673	0.0784	0.1325	0.2514	-	-	-	-	-	-
<b>EC</b>	0.2533	0.4914	0.2861	0.1009	0.1134	0.1163	0.5366	0.3533	0.4760	0.4347	0.2715	0.4561
<b>OECD</b>	0.5070	0.7337	0.6631	0.3014	0.3873	0.1719	0.8525	0.9821	0.2560	0.9570	0.9912	0.2692
<b>IMF</b>	0.9483	0.3473	0.4732	0.7567	0.3953	0.5478	0.8701	0.2940	0.4739	0.9870	0.2602	0.3857
	1 year ahead						18 months ahead					
	unbiasedness			efficiency			unbiasedness			efficiency		
	Lag 1	Lag 2	Lag 3	Lag 1	Lag 2	Lag 3	Lag 1	Lag 2	Lag 3	Lag 1	Lag 2	Lag 3
<b>BP</b>	0.8885	0.1280	0.2177	0.5510	0.1153	0.1718	0.9006	0.1318	0.2199	0.3739	0.0982	0.1718
<b>CFP</b>	0.9860	0.4537	0.4872	0.2049	0.2514	0.1718	0.8281	0.1868	0.2546	0.0282	0.0825	0.1718
<b>MF</b>	0.9718	0.1177	0.2044	0.9918	0.0913	0.1718	-	-	-	-	-	-
<b>EC</b>	0.7649	0.1814	0.2870	0.1744	0.1531	0.1718	0.7085	0.2276	0.2430	0.1276	0.1974	0.1718
<b>OECD</b>	0.9670	0.1294	0.2518	0.3722	0.0822	0.1718	0.9882	0.1830	0.1830	0.0504	0.1387	0.1718
<b>IMF</b>	0.9347	0.5407	0.4278	0.2211	0.0850	0.1718	0.6194	0.2060	0.2345	0.9850	0.5835	0.1718

Notes: p-values below or equal to 0.05 (0.1) are shaded in dark grey (light grey) and indicate rejection of the null hypothesis at a significance level of 5% (10%)

**Table A 15. Inflation - tests for unbiasedness and efficiency (shorter period)**

	Current year			6 months ahead		
	Test for unbiasedness		Test for efficiency	Test for unbiasedness		Test for efficiency
	$\alpha$	$\alpha = 0$	$\alpha = 0, \beta = 1$	$\alpha$	$\alpha = 0$	$\alpha = 0, \beta = 1$
<b>BP</b>	-0.050	0.363	0.3545	-0.150	0.226	0.5216
<b>CFP</b>	-0.067	0.067*	0.1110*	-0.150	0.518	0.5388
<b>MF</b>	0.017	0.849	0.8977	-	-	-
<b>EC</b>	-0.033	0.611	0.7606	-0.100	0.524	0.7843
<b>OECD</b>	0.017	0.695	0.8575	-0.033	0.750	0.9420
<b>IMF</b>	-0.275	0.045	0.1465	-0.108	0.525	0.6934

	1 year ahead			18 months ahead		
	Test for unbiasedness		Test for efficiency	Test for unbiasedness		Test for efficiency
	$\alpha$	$\alpha = 0$	$\alpha = 0, \beta = 1$	$\alpha$	$\alpha = 0$	$\alpha = 0, \beta = 1$
<b>BP</b>	-0.320	0.388	0.5209	-0.480	0.210	0.3748*
<b>CFP</b>	-0.340	0.344	0.5078	-0.460	0.339	0.0096*
<b>MF</b>	-0.400	0.218	0.2610*	-	-	-
<b>EC</b>	-0.460	0.244	0.4165	-0.640	0.167	0.0690
<b>OECD</b>	-0.020	0.963	0.0346*	-0.260	0.633	0.0081*
<b>IMF</b>	-0.634	0.145	0.0274*	-0.662	0.172	0.0034

Notes: p-values below or equal to 0.05 (0.1) are shaded in dark grey (light grey) and indicate rejection of the null hypothesis at a significance level of 5% (10%).

\* p-value when correcting the standard errors.

**Table A 16. Inflation - Diebold Mariano test statistics (shorter period)**

**2002-2021**

	Current year						6 months ahead						
	BP	CFP	MF	EC	OECD	IMF	BP	CFP	MF	EC	OECD	IMF	
<b>BP</b>	-	-0.086	-0.287	-0.188	0.358	-0.712	<b>BP</b>	-	-0.858	-	-0.282	0.342	-0.615
<b>CFP</b>	0.086	-	-0.258	-0.079	0.484	-0.656	<b>CFP</b>	0.858	-	-	1.058	0.765	0.962
<b>MF</b>	0.287	0.258	-	0.198	0.429	-0.475	<b>MF</b>	-	-	-	-	-	-
<b>EC</b>	0.188	0.079	-0.198	-	0.346	-0.737	<b>EC</b>	0.282	-1.058	-	-	0.323	-0.188
<b>OECD</b>	-0.358	-0.484	-0.429	-0.346	-	-0.738	<b>OECD</b>	-0.342	-0.962	-	-0.323	-	-0.564
<b>IMF</b>	0.712	0.656	0.475	0.737	0.738	-	<b>IMF</b>	0.615	-0.962	-	0.188	0.564	-

**2003-2021**

	1 year ahead						18 months ahead						
	BP	CFP	MF	EC	OECD	IMF	BP	CFP	MF	EC	OECD	IMF	
<b>BP</b>	-	0.056	0.397	-0.360	-0.211	-0.797	<b>BP</b>	-	-1.084	-	-0.698	-1.413	-0.678
<b>CFP</b>	-0.056	-	0.124	-0.263	-0.216	-0.644	<b>CFP</b>	1.084	-	-	-0.151	-0.380	-0.286
<b>MF</b>	-0.397	-0.124	-	-0.706	-0.264	-1.340	<b>MF</b>	-	-	-	-	-	-
<b>EC</b>	0.360	0.263	0.706	-	0.015	-0.895	<b>EC</b>	0.698	0.151	-	-	-0.153	-0.567
<b>OECD</b>	0.211	0.216	0.264	-0.015	-	-0.249	<b>OECD</b>	1.413	0.380	-	0.153	-	0.012
<b>IMF</b>	0.797	0.644	1.340	0.895	0.249	-	<b>IMF</b>	0.678	0.286	-	0.567	-0.012	-



**Table A 17. Inflation - version modified of Diebold Mariano - HLN (shorter period)**

**2002-2021**

	<b>Current year</b>						<b>6 months ahead</b>						
	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>	
<b>BP</b>	-	-0.032	-0.107	-0.070	0.133	-0.265	<b>BP</b>	-	-0.320	-	-0.105	0.127	-0.229
<b>CFP</b>	0.032	-	-0.096	-0.029	0.180	-0.245	<b>CFP</b>	0.320	-	-	0.394	0.285	0.358
<b>MF</b>	0.107	0.096	-	0.074	0.160	-0.177	<b>MF</b>	-	-	-	-	-	-
<b>EC</b>	0.070	0.029	-0.074	-	0.129	-0.275	<b>EC</b>	0.105	-0.394	-	-	0.120	-0.070
<b>OECD</b>	-0.133	-0.180	-0.160	-0.129	-	-0.275	<b>OECD</b>	-0.127	-0.285	-	-0.120	-	-0.210
<b>IMF</b>	0.265	0.245	0.177	0.275	0.275	-	<b>IMF</b>	0.229	-0.358	-	0.070	0.210	-

**2003-2021**

	<b>1 year ahead</b>						<b>18 months ahead</b>						
	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>	<b>BP</b>	<b>CFP</b>	<b>MF</b>	<b>EC</b>	<b>OECD</b>	<b>IMF</b>	
<b>BP</b>	-	0.022	0.159	-0.144	-0.084	-0.319	<b>BP</b>	-	-0.434	-	-0.279	-0.565	-0.271
<b>CFP</b>	-0.022	-	0.050	-0.105	-0.086	-0.258	<b>CFP</b>	0.434	-	-	-0.060	-0.152	-0.114
<b>MF</b>	-0.159	-0.050	-	-0.282	-0.106	-0.536	<b>MF</b>	-	-	-	-	-	-
<b>EC</b>	0.144	0.105	0.282	-	0.006	-0.358	<b>EC</b>	0.279	0.060	-	-	-0.061	-0.227
<b>OECD</b>	0.084	0.086	0.106	-0.006	-	-0.099	<b>OECD</b>	0.565	0.152	-	0.061	-	0.005
<b>IMF</b>	0.319	0.258	0.536	0.358	0.099	-	<b>IMF</b>	0.271	0.114	-	0.227	-0.005	-

**Table A 18. GDP growth – combined forecasts– Diebold Mariano test statistics (longer period)**

<b>2002-2021</b>									
<b>Current year</b>					<b>6 months ahead</b>				
	<b>all</b>	<b>national</b>	<b>international</b>	<b>trimmed</b>		<b>all</b>	<b>national</b>	<b>international</b>	<b>trimmed</b>
<b>BP</b>	-0.2587	-0.2620	-0.3447	-0.2709	<b>BP</b>	-0.5663	-	-0.6295	-0.5642
<b>MF</b>	0.3125	0.4451	0.0420	-0.2406	<b>MF</b>	-	-	-	-
<b>EC</b>	0.4088	0.3345	0.3798	-0.2289	<b>EC</b>	0.4942	-	0.2705	0.4555
<b>OECD</b>	-0.4636	-0.2491	-0.4537	-0.2676	<b>OECD</b>	0.3935	-	0.2946	0.3736
<b>IMF</b>	0.3307	0.3273	0.3261	-0.1959	<b>IMF</b>	0.2408	-	-0.0835	0.1835
<b>All</b>	-	0.1237	-0.3114	-0.2565	<b>All</b>	-	-	-0.7669	-0.2357
<b>National</b>	-	-	-0.2458	-0.2606	<b>National</b>	-	-	-	-
<b>International</b>	-	-	-	-0.2436	<b>International</b>	-	-	-	0.6890

<b>2003-2021</b>									
<b>1 year ahead</b>					<b>18 months ahead</b>				
	<b>all</b>	<b>national</b>	<b>international</b>	<b>trimmed</b>		<b>all</b>	<b>national</b>	<b>international</b>	<b>trimmed</b>
<b>BP</b>	-0.3796	-0.3433	-0.3941	-0.3690	<b>BP</b>	-0.6923	-	-0.7300	-0.6133
<b>MF</b>	0.4123	0.4759	0.3443	0.4137	<b>MF</b>	-	-	-	-
<b>EC</b>	0.0081	0.0962	-0.1315	-0.0396	<b>EC</b>	0.0732	-	-0.2512	0.2311
<b>OECD</b>	0.2927	0.3229	0.2608	0.2827	<b>OECD</b>	0.4914	-	0.3639	0.5266
<b>IMF</b>	0.2678	0.2541	0.2551	0.2501	<b>IMF</b>	0.1017	-	-0.0417	0.1476
<b>All</b>	-	0.1645	-0.2227	-0.1577	<b>All</b>	-	-	-0.8209	0.2863
<b>National</b>	-	-	-0.1880	-0.1841	<b>National</b>	-	-	-	-
<b>International</b>	-	-	-	0.1546	<b>International</b>	-	-	-	0.6787

**Table A 19. GDP growth – combined forecasts - version modified of Diebold Mariano - HLN (longer period)**

<b>2002-2021</b>									
<b>Current year</b>					<b>6 months ahead</b>				
	<b>all</b>	<b>national</b>	<b>international</b>	<b>trimmed</b>		<b>all</b>	<b>national</b>	<b>international</b>	<b>trimmed</b>
<b>BP</b>	-0.0564	-0.0571	-0.0751	-0.0590	<b>BP</b>	-0.1234	-	-0.1372	-0.1230
<b>MF</b>	0.0681	0.0970	0.0092	-0.05243	<b>MF</b>	-	-	-	-
<b>EC</b>	0.0891	0.0729	0.0828	-0.0499	<b>EC</b>	0.1077	-	0.0590	0.0993
<b>OECD</b>	-0.1010	-0.0543	-0.0989	-0.0583	<b>OECD</b>	0.0858	-	0.0642	0.0814
<b>IMF</b>	0.0721	0.0713	0.0711	-0.0427	<b>IMF</b>	0.0525	-	-0.0182	0.0400
<b>All</b>	-	0.0269	-0.0679	-0.0559	<b>All</b>	-	-	-0.1671	-0.0514
<b>National</b>	-	-	-0.0536	-0.0568	<b>National</b>	-	-	-	-
<b>International</b>	-	-	-	-0.0531	<b>International</b>	-	-	-	0.1502

<b>2003-2021</b>									
<b>1 year ahead</b>					<b>18 months ahead</b>				
	<b>all</b>	<b>national</b>	<b>international</b>	<b>trimmed</b>		<b>all</b>	<b>national</b>	<b>international</b>	<b>trimmed</b>
<b>BP</b>	-0.0827	-0.0748	-0.0859	-0.0804	<b>BP</b>	-0.1509	-	-0.1591	-0.1337
<b>MF</b>	0.0899	0.1037	0.0750	0.0902	<b>MF</b>	-	-	-	-
<b>EC</b>	0.0018	0.0210	-0.0287	-0.0086	<b>EC</b>	0.0159	-	-0.0547	0.0504
<b>OECD</b>	0.0638	0.0704	0.0568	0.0616	<b>OECD</b>	0.1071	-	0.0793	0.1148
<b>IMF</b>	0.0584	0.0554	0.0556	0.0545	<b>IMF</b>	0.0222	-	-0.0091	0.0322
<b>All</b>	-	0.0358	-0.0485	-0.0344	<b>All</b>	-	-	-0.1789	0.0624
<b>National</b>	-	-	-0.0410	-0.0401	<b>National</b>	-	-	-	-
<b>International</b>	-	-	-	0.0337	<b>International</b>	-	-	-	0.1479

**Table A 20. Inflation – combined forecasts - Diebold Mariano test statistics (longer period)**

<b>2002-2021</b>									
<b>Current year</b>					<b>6 months ahead</b>				
	<b>all</b>	<b>national</b>	<b>international</b>	<b>trimmed</b>		<b>all</b>	<b>national</b>	<b>international</b>	<b>trimmed</b>
<b>BP</b>	-0.4718	-	-0.5553	-0.2770	<b>BP</b>	-0.3858	-	-0.5228	-0.4088
<b>MF</b>	-	-	-	-	<b>MF</b>	-	-	-	-
<b>EC</b>	0.4159	-	0.0047	0.7646	<b>EC</b>	0.2278	-	-0.1541	-0.0234
<b>OECD</b>	-0.2932	-	-0.4412	-0.1382	<b>OECD</b>	0.2477	-	-0.0895	0.0364
<b>IMF</b>	0.7424	-	0.7303	0.7288	<b>IMF</b>	0.6741	-	0.5997	0.5665
<b>All</b>	-	-	-0.6844	0.4497	<b>All</b>	-	-	-0.6235	-0.2967
<b>National</b>	-	-	-	-	<b>National</b>	-	-	-	-
<b>International</b>	-	-	-	0.6097	<b>International</b>	-	-	-	0.2163

<b>2003-2021</b>									
<b>1 year ahead</b>					<b>18 months ahead</b>				
	<b>all</b>	<b>national</b>	<b>international</b>	<b>trimmed</b>		<b>all</b>	<b>national</b>	<b>international</b>	<b>trimmed</b>
<b>BP</b>	-0.2984	-	-0.3113	-0.3140	<b>BP</b>	-0.2098	-	-0.2426	-0.2671
<b>MF</b>	-	-	-	-	<b>MF</b>	-	-	-	-
<b>EC</b>	0.2231	-	0.1422	0.2247	<b>EC</b>	0.3899	-	-0.0047	0.0568
<b>OECD</b>	-0.1912	-	-0.2586	-0.1891	<b>OECD</b>	0.2767	-	0.1683	0.1675
<b>IMF</b>	0.5192	-	0.5319	0.4678	<b>IMF</b>	0.3932	-	0.3458	0.3061
<b>All</b>	-	-	-0.3426	-0.0288	<b>All</b>	-	-	-0.3222	-0.4374
<b>National</b>	-	-	-	-	<b>National</b>	-	-	-	-
<b>International</b>	-	-	-	0.2749	<b>International</b>	-	-	-	0.0804

**Table A 21. Inflation – combined forecasts - version modified of Diebold Mariano - HLN (longer period)**

<b>2002-2021</b>									
<b>Current year</b>					<b>6 months ahead</b>				
	<b>all</b>	<b>national</b>	<b>international</b>	<b>trimmed</b>		<b>all</b>	<b>national</b>	<b>international</b>	<b>trimmed</b>
<b>BP</b>	-0.1028	-	-0.1210	-0.0604	<b>BP</b>	-0.0841	-	-0.1139	-0.0891
<b>MF</b>	-	-	-	-	<b>MF</b>	-	-	-	-
<b>EC</b>	0.0906	-	0.0010	0.1666	<b>EC</b>	0.0496	-	-0.0336	-0.0051
<b>OECD</b>	-0.0639	-	-0.0961	-0.0301	<b>OECD</b>	0.0540	-	-0.0195	0.0079
<b>IMF</b>	0.1618	-	0.1592	0.1588	<b>IMF</b>	0.1469	-	0.1307	0.1235
<b>All</b>	-	-	-0.1492	0.0980	<b>All</b>	-	-	-0.1359	-0.0647
<b>National</b>	-	-	-	-	<b>National</b>	-	-	-	-
<b>International</b>	-	-	-	0.1329	<b>International</b>	-	-	-	0.0471

<b>2003-2021</b>									
<b>1 year ahead</b>					<b>18 months ahead</b>				
	<b>all</b>	<b>national</b>	<b>international</b>	<b>trimmed</b>		<b>all</b>	<b>national</b>	<b>international</b>	<b>trimmed</b>
<b>BP</b>	-0.0650	-	-0.0678	-0.0684	<b>BP</b>	-0.0457	-	-0.0529	-0.0582
<b>MF</b>	-	-	-	-	<b>MF</b>	-	-	-	-
<b>EC</b>	0.0486	-	0.0310	0.0490	<b>EC</b>	0.0850	-	-0.0010	0.0124
<b>OECD</b>	-0.0417	-	-0.0564	-0.0412	<b>OECD</b>	0.0603	-	0.0367	0.0365
<b>IMF</b>	0.1131	-	0.1159	0.1019	<b>IMF</b>	0.0857	-	0.0754	0.0667
<b>All</b>	-	-	-0.0747	-0.0063	<b>All</b>	-	-	-0.0702	-0.0953
<b>National</b>	-	-	-	-	<b>National</b>	-	-	-	-
<b>International</b>	-	-	-	0.0599	<b>International</b>	-	-	-	0.0175