EVALUATION OF AIREF'S MACROECONOMIC AND FISCAL FORECASTS

TECHNICAL DOCUMENT 3/23

December 27th, 2023





The mission of the Independent Authority for Fiscal Responsibility, AAI (AIReF) is to ensure strict compliance with the principles of budgetary stability and financial sustainability enshrined in Article 135 of the Spanish Constitution.

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EXECUTIVE SUMMARY

By publishing this technical document, the Independent Authority for Fiscal Responsibility, A.A.I. (AIReF) maintains its commitment to analysing the quality of the macroeconomic and fiscal forecasts it has been making since 2015, incorporating the years 2021 and 2022 into the study¹. Due to their nature, under normal circumstances forecasts are subject to great uncertainty, which has been extraordinarily accentuated in recent years because of the pandemic and the outbreak of the war in Ukraine and other geopolitical tensions. In this highly shifting context, the analysis of forecast errors becomes even more important as it makes it possible to identify those macroeconomic aggregates where AIReF's forecasts may be less accurate and remedy potential biases and weaknesses in the estimate process. This transparency exercise is in line with AIReF's core values and places it on a par with other independent fiscal institutions that already perform this type of exercise. This is in response to one of the OECD's main recommendations and to the content of AIReF's Strategic Plan 2020-2026.

Macroeconomic forecasts

Forecasts of GDP growth, employment and inflation form the basis for the projections of public revenue and expenditure that are incorporated into budgetary plans. Unrealistic macroeconomic forecasts make it difficult to plan the budgetary process, comply with fiscal rules and, in short, ensure mediumand short-term fiscal discipline.

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¹ The detailed analysis of macroeconomic forecasts is limited to 2022.



Accordingly, EU Regulation 473/2013 establishes that the macroeconomic forecasts that serve as the basis for drawing up budgetary plans and stability programmes must be produced or endorsed by independent fiscal institutions, such as AIReF. Directive 2011/85/EU also establishes that the macroeconomic and budgetary forecasts contained in budgetary plans should be subject to regular evaluations to improve their quality and determine the potential existence of systematic biases.

In this regard, AIReF regularly includes in its reports an evaluation of the Government's forecasts based on a methodology developed to this end (see Report 21/22). Furthermore, with the aim of enhancing transparency, AIReF also performs an ex-post evaluation of its own forecasts, which are the basis for analysing the degree of realism of the Government's scenarios and, in the case of macroeconomic forecasts, to endorse them.

This evaluation exercise of AIReF's macroeconomic forecasts is undertaken using two approaches:

1. The short-term approach focuses on analysing the magnitude of the forecast error in 2022 with respect to the full-year estimate published by the Spanish National Accounts in April 2023² and the factors underlying this error. In particular, an analysis is made to distinguish the contribution to the forecast error of the external assumptions, of the revisions of the Spanish National Accounts figures and of other elements where errors are due to both the modelling of the macroeconomic aggregates used - which may be relevant given the difficulty in modelling the series of shocks experienced in recent years - to expert opinions and to surprises of a more genuine nature. The results suggest that the Spanish economy maintained a certain resilience in a very complex context characterised by the persistence of the economic implications of the pandemic and the war in Ukraine, which is reflected in GDP growth for 2022 that was higher than AIReF's spring forecast for that year. This outcome extends to the main demand aggregates. According to the

² In contrast to the medium-term approach, this detailed approach takes the April 2023 data as this is the date of the Stability Programme Update and thus allows for an evaluation of the most up-to-date exogenous assumptions.



analysis performed, neither the revision of the Spanish National Accounts figures for 2021 (carry-over effect), nor the incorporation of data observed on external assumptions are sufficient to explain this positive surprise. In this regard, the good performance shown by exports of goods and services once the currently available Spanish National Accounts information is considered stands out compared with what the models would have estimated with the information observed on the external assumptions.

- 2. The medium-term approach is made with a longer time perspective based on a range of statistics that are commonly used to evaluate the quality of forecasts, following the methodological approach of Technical Document 2/2022 of February 18th, 2022³. The purpose is to analyse the magnitude of errors and the potential existence of biases and their persistence. The main conclusions drawn are as follows:
 - a. The incorporation of the years 2021-2022 entails hardly any changes to the statistical quality measures in AIReF's forecasts. The measures continue to be satisfactory in terms of efficiency, accuracy, and lack of bias.
 - b. AIReF does not commit systematic biases or errors when estimating GDP and its demand components in the current year. By incorporating the years 2021-2022, the tendency to overestimate the growth of private consumption and of exports and imports is mitigated. However, the tendency to underestimate employment growth in the current year is accentuated.
 - c. As regards the following year, the average errors increase due to the existence of a greater degree of uncertainty. Incorporating the years 2021-2022 corrects the optimism of export growth forecasts and the pessimism of employment. However, there is a tendency for gross fixed capital formation to be overestimated because, as AIReF has stressed in all its reports, it prepares its forecasts on the assumption that the revenue budgeted in the Recovery, Transformation and Resilience Plan (RTRP) will be fully executed,

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³See Report 21/22. Unlike the short-term approach, this approach takes as a reference for each year the first publication of the full year available in the Spanish National Accounts flash estimate of January t+1.



- while in practice there have been delays in this revenue reaching real activity.
- d. There continues to be an absence of persistent errors, except for gross fixed capital formation forecasts for the following year, where overestimates for the following year are often accompanied by actual overestimates in that year. This persistence is linked to the assumptions of full execution of the RTRP.
- e. Compared with other institutions, there are still no significant differences between the biases and the accuracy of the forecasts of the different institutions and AIReF. AIReF continues to forecast GDP growth in the current year with greater certainty, but it is less accurate in forecasting the evolution of the foreign sector in the current year and of gross fixed capital formation.

Fiscal forecasts

The inclusion of years 2021 and 2022 in the analysis confirms the absence of any significant bias in AIReF's fiscal forecasts over the course of the whole period. Moreover, AIReF's forecasts were on average more accurate than those of the Government. Furthermore, in 2021 and 2022 they were also more accurate than the average of other analysts' deficit forecasts. In addition, in 2022 the widespread nature of the deviation of most of the institutions considered (pessimistic) was of the opposite sign to AIReF's (optimistic). AIReF's deviation during the two years analysed remained among the five most accurate.

The average public deficit forecast error was 0.9 points of GDP above the final figure observed in 2021 and 0.3 points of GDP below the final figure in 2022. In a context characterised by high uncertainty, the errors in 2021 and 2022 were mainly due to three competing factors: the adoption of measures at later points in time than the when the forecasts were made, the materialisation of tax collection elasticities significantly above historical values and, in the case of the expenditure and revenue forecasts, a slower execution of the RTRP than initially expected.

AIReF continues to work on improving the weaknesses in the areas identified. In this regard, it is worth highlighting the breakdown of the variability of the main tax figures carried out in fiscal year 2023⁴ to quantify the different factors that have caused the increase in revenue over the last two years.

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⁴See <u>Technical Document 2/23</u>

AIReF is also looking more closely at the mechanisms to monitor the regulatory measures that impact the forecasts and the monitoring of the execution of the RTRP. However, the limited availability of information on the impact of the plan in terms of the Spanish National Accounts for the revenue and expenditure of the General Government is beyond the scope of AIReF's analysis. Furthermore, due to their discretionary nature, it is not possible to anticipate the impact of unannounced measures on the forecasts.

ANALYSIS OF MACROECONOMIC FORECASTS

The first Section 1.1 describes the forecast errors made in 2022 and the factors underlying the error with respect to the latest available publication at the close of the report for the demand aggregates. Section 1.2 summarises the main findings of the statistical analysis of the errors made in the period 2016-2022 and Annexes I and II provide details of the figures and statistics underlying the main findings.

1.1. Analysis of macroeconomic forecast errors for the year 2022

2022 was marked by the outbreak of the war in Ukraine in February, which triggered a global energy crisis. This uncertain environment added to the succession of shocks suffered since 2020, notably the COVID-19 pandemic, which showed significant rates of contagion in the first few months of 2022, to which should be added the pressures on value chains and commodities shortages that were highlighted from mid-2021. This led to a spike in inflation initially driven by higher energy input prices, exacerbated by the Russian gas supply cut-off as from the summer of 2022. As a result, the outlook

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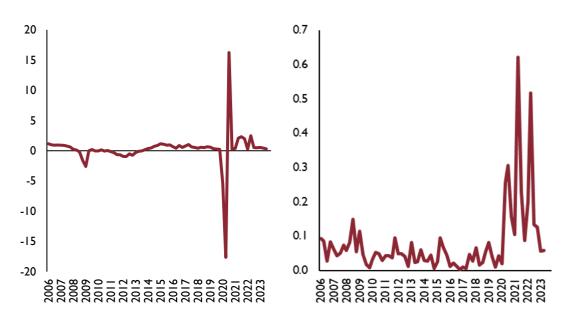
for global growth deteriorated and there was a drastic tightening of the monetary policy stance.

These events have led to greater variability in the evolution of GDP, which makes forecasting more difficult. As can be seen in Figure 1, which shows the quarter-on-quarter rate of GDP growth in volume terms, in recent years there has been an increase in the volatility of economic indicators and, consequently, of the main macroeconomic aggregates, which makes forecasting more difficult. There are also larger revisions between the first QNA estimate and successive estimates. In particular, when analysing the standard deviation of the quarter-on-quarter rates of change in the first seven GDP observations for each quarter as an indicator of the volatility of this aggregate, we observe a substantial increase in volatility that exceeds even that observed during the financial and sovereign debt crisis from 2008 to 2012⁵.

FIGURE 1. RECENT QUARTERLY EVOLUTION OF GDP IN VOLUME TERMS

FIGURE 1.A. QUARTER-ON-QUARTER RATE OF CHANGE

FIGURE 1.B. STANDARD DEVIATION OF THE QUARTER-ON-QUARTER RATE OF CHANGE IN GDP IN VOLUME TERMS



Source: INE

Note: For the quantification of the standard deviation of the INE estimates, the first seven QNA estimates for each quarter have been used. For 2023, only a limited number of estimates are available for each quarter; hence, from the first quarter of 2023 onwards, the standard deviation has been calculated using each of the estimates available at the closing date of this document.

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⁵ Volatility indicators for demand-side aggregates can be found in ANNEX III.



Consequently, the forecast errors of the forecast panels have been higher.

Given the relationship between quarter-on-quarter rates and annual rates of change⁶, a greater variability of quarter-on-quarter rates automatically impacts the estimates of annual aggregate growth. As a result, even forecasts made only a few days before the publication of the first annual estimate for 2022 - made on January 27th, 2023 - have a historically high average error. According to the new revision policy introduced by the INE on January 27th, 2023, the quarterly profile of the seasonally-adjusted series corrected for the calendar effect for the current year could be altered each time the QNA is published compared with what was initially published (and for the previous year as long as an estimate of the annual Spanish National Accounts is not available). This new policy could help to mitigate these errors.

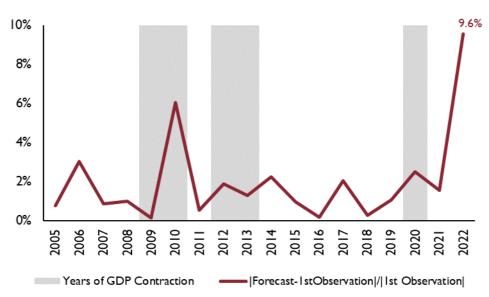


FIGURE 2. RELATIVE FORECAST ERROR OF THE FORECASTING PANELS IMMEDIATELY PRIOR TO THE RELEASE OF THE FIRST ESTIMATE FOR EACH YEAR (%)

Source: FUNCAS panels for January/February of each year and AIReF

Against this backdrop, AIReF's forecasts for GDP in volume terms for 2022 were subject to a high degree of uncertainty. The analysis carried out based on AIReF's Quarterly Model (AQM) makes it possible to break down the forecast errors for a macroeconomic aggregate into four main blocks:

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⁶See, for example, <u>Bank of Spain's Analytical Articles 3/2019</u>.



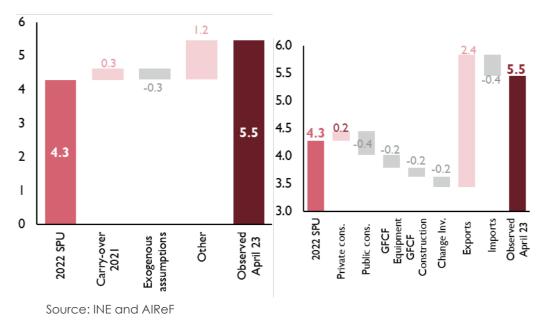
- i. Those associated with the revision of the QNA aggregate series by the INE in the previous year. This effect is referred to as "Carry-over 2021",
- ii. Those linked to forecast errors in the evolution of the exogenous assumptions of the AQM. This section includes both variables taken directly from other organisations such as global trade, interest rates, commodity prices, as well as other variables such as household wealth, credit variables and productive capacity utilisation, among others, which are included in "Exogenous assumptions",
- iii. The other factors that impact on the forecast. This "Other" category includes both the estimate error associated with the models used and the endogenous variables that are introduced, as well as the errors related to the elements of judgement introduced. Under normal circumstances, the error associated with the model should be small. However, given that the modelling of the impact of COVID-19 on the aggregates could only be partially performed at the time of the preparation of the 2022-2025 SPU, this factor would also reflect the impact of the pandemic on structural relations.

In 2022, compared with the GDP growth forecast of 4.3% made by AIReF in May 2022, the annual estimate derived from the QNA observed in April 2023 was 5.5%. Figures 3.A and 3.B show the forecast errors made in 2022, as well as the breakdown into their main determinants for GDP and the main aggregates on the demand side. Looking at the sources of the forecast error, the carry-over effect, considered in aggregate terms, would have led to GDP growth being underestimated by 0.3 pp. This effect would have been offset by the revision of the underlying exogenous assumptions which had an overall impact on the forecast error of -0.3 pp. According to these results, GDP turned out to be 1.2 pp lower than what AIReF's models would have forecast with perfect information.

By demand component, the strong contribution to the forecast error in exports of goods and services stands out. When the contribution to the error is analysed by demand component, the largest errors were made in exports of goods and services, which grew much faster than expected and contributed 2.4 pp to the aggregate error in GDP growth. The increase in private consumption was also slightly higher than expected, while the rest of the components recorded a lower increase than AIReF expected.



FIGURE 3. ERROR IN THE FORECAST OF GDP CHANGE IN 2022 IN THE 2022-2025 SPU
FIGURE 3.A. SOURCES OF FORECAST ERROR
FIGURE 3.B. CONTRIBUTION BY DEMAND COMPONENT



The breakdown of the sources of error based on the AQM yields the following conclusions for the modelled aggregates:

- i. Although at the aggregate level the carry-over effect associated with the revision of the 2021 accounting figures is small, it is very high at the component level. There is a high incidence of carry-over effects for investment aggregates and, to a lesser extent, for the foreign sector. In most of the aggregates, the carry-over effect was negative, but this effect is offset by the revision of imports, public consumption and the change in inventory made by the INE. These last two components are not incorporated in the error analysis, as the AQM does not have equations to forecast these variables.
- ii. Revisions to the exogenous assumptions make a relatively modest contribution to the forecast error of the various components. This result may be surprising given that in spring 2022 the increase in commodity prices and in gas prices that would be associated with Russia's invasion of Ukraine could not be anticipated. In this regard, it should be noted on the one hand that the AQM only incorporates the price of oil through the price equations, so that the impact on the estimate error made for the demand aggregates through this channel is reflected to a minor extent in "Other". On the other hand, regarding the spring 2022 estimates, the euro area growth in the aggregate of



- 2022 was like the forecast, while global trade growth was somewhat higher than initially expected.
- iii. In all the components, the revisions to the QNA figures for 2021 and the exogenous assumptions would have led to lower growth than expected by AIReF. The factors included under "Other" have a positive and high contribution in most of the components. This would indicate that most of the aggregates sustained higher than expected growth in such an adverse international context. The difficulty in modelling the series of shocks suffered in recent years may also contribute to this result. In particular, the strength of the foreign sector in the context of COVID-19, the invasion of Ukraine and pressures on global value chains is significant and is instrumental in explaining the forecast errors. For further information, see the analysis in Box 3 of Report 21/23 of May 11th, 2023, which analyses the recent evolution of Spanish exports of goods and services.



FIGURE 4. FORECAST ERRORS OF DEMAND COMPONENTS. 2022-2025 SPU

FIGURE 4.A. PRIVATE CONSUMPTION (%)

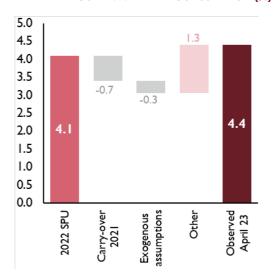


FIGURE 4.B. GFCF CAPITAL GOODS AND CULTIVATED ASSETS

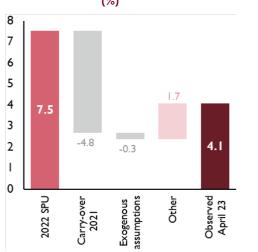


FIGURE 4.C. GFCF CONSTRUCTION AND INTELLECTUAL PROPERTY (%)

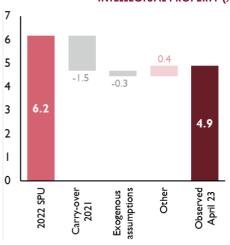


FIGURE 4.D. EXPORTS OF GOODS AND SERVICES (%)

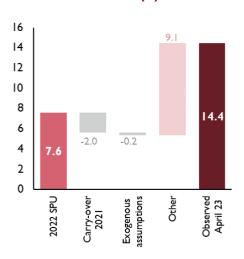
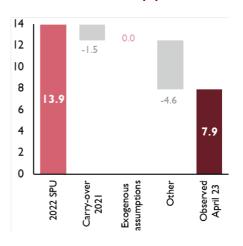


FIGURE 4.E. IMPORTS OF GOODS AND SERVICES
(%)



Source: INE and AIReF

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1.2. Statistical analysis of forecast errors of the macroeconomic outlook 2016-2022

The average error made in AIReF's estimates for GDP at constant prices is not significantly different from zero and no persistence is discernible. The forecast errors made when estimating the GDP growth rate are sustained at low levels until the outbreak of COVID-19, from which point onwards they increase, reflecting greater uncertainty. Moreover, forecast errors are not persistent, either for the current year or for the following year.

The forecast errors of the demand aggregates show greater variability than those of GDP, especially for those relating to the foreign sector. In the case of private consumption, the errors are generally positive, although no statistically significant biases are apparent in the estimates for the current year. In the case of investment, the assumption of full execution of the RTRP has translated into optimism in the estimate of this aggregate in recent years compared with the data finally observed, although the bias in the estimates for the current year is not statistically significant either. AlReF's forecasts reflect an absence of bias in the estimate of public consumption, although in recent years there are comparatively high errors in relation to the historical average that are associated with the implementation of fiscal measures to mitigate the impact of the pandemic and the energy crisis. In the case of exports, in contrast, errors of a negative magnitude have been observed in recent years, while there is a tendency to be optimistic about the growth of imports for the following year given the high correlation of this component to investment.

The largest contributions to the error in estimating GDP growth come from estimates for the foreign sector. However, in recent years, the contributions from private consumption and investment have been growing. Compared with the Government's forecasts, AIReF's forecasts for GDP for the current year and the following year are relatively more accurate. AIReF's private consumption estimates are also among the most accurate compared with other institutions.

In the case of employment, AIReF has tended to underestimate its growth, although the biases are not statistically significant in the following year's estimates. Moreover, in the wake of the pandemic, the accuracy of the employment estimates has improved. The mean squared error in forecasting employment is somewhat higher than that of the Government, although it is in line with that of other institutions.



The breakdown of the statistics and tests supporting these conclusions can be found in Annexes I and II.

2. EVALUATION OF THE FORECASTS IN THE FISCAL SCENARIO

In this document, AIReF analyses the errors made in its fiscal forecasts for the years 2021 and 2022. This document is a continuation of the self-assessment and transparency exercise that began in 2022 in which it addressed the quality and accuracy of its fiscal forecasts from 2016 to 20207. The forecasts analysed are those contained in the reports linked to the budget cycle, which involve six revisions for each reference year and are compared with the first available evaluation, which corresponds to the IGAE's first publication on the close of the accounting year (at the end of March of the year following the reference year), referred to henceforth as flash estimate.

The evaluation of fiscal forecasts focuses on analysing the deviation found in the fiscal balance forecasts, breaking down the errors made. The breakdown performed for the revenue and expenditure of the General Government Sector is carried out by breaking down the different causes:

• Error due to macroeconomic scenario forecasts.

⁷See <u>Technical Document 2/2022</u>



- Error because of policy measures, considering both the incorporation of measures adopted between revisions and changes in the assessment of measures as more information has become available.
- Error due to AIReF's own fiscal estimates.

AlReF's fiscal balance forecasts are also compared with those of the Government and other institutions and the error made in each of the expenditure and revenue headings is analysed. On this occasion, for the two years included in the evaluation of the forecast errors, comparisons are made with the estimates of other institutions and the breakdown of the error by General Government sub-sector is analysed. Once the deviations over the last two years have been analysed, an evaluation is made of the evolution of AIReF's forecasts over the 2016-2022 period to identify relevant biases, systematic deviations and potential weaknesses in the estimates.

2.1. Forecast errors for 2021

Forecasts for 2021 are marked by a high degree of uncertainty associated with the reactivation of economic activity in the wake of COVID-19 and, from the second half of the year, by the rise in energy prices. Progress in vaccination in both Spain and neighbouring countries and the elimination of mobility restrictions led to a recovery of business and consumer confidence, triggering a strong reaction in industrial production and global trade, although international tourism remained at lower levels than those observed before the health crisis. Energy prices began to rise from the second quarter of the year onwards and, because of growing international demand, recorded their highest increases in the last few months compared with recent years.

Against this backdrop, the evolution of fiscal outcomes was affected by three determinants acting in opposing directions:

 The adoption of regulatory measures, both successive extensions of those aimed at mitigating the effects of the COVID-19 crisis and the adoption of new measures not initially foreseen to mitigate the effects of the price increases.



- The incorporation of the RTRP8 in the 2021 General State Budget, approved in October 2020, which included the necessary appropriations for its implementation and whose execution began in May 2021. Although the plan is neutral in deficit terms, it affected the valuation, distribution, and evolution of both the revenue and expenditure of the General Government.
- The strong growth in tax revenue associated with the constant improvement in activity and price increases, which led to a recovery of the tax bases that exceeded those recorded in the macroeconomic data of the Spanish National Accounts.

TABLE 1. 2021 PROJECTIONS OF THE FISCAL BALANCE IN SPANISH NATIONAL ACCOUNTS (%GDP)

BALANCE 2021							
Revision	Date	AIReF	Government				
I	5/6/2020	-7.5					
2	11/5/2020	-8.0	-7.7				
3	4/8/2021	-7.6					
4	5/11/2021	-7.8	-8.4				
5	7/15/2021	-7.9					
6	10/25/2021	-7.9	-8.4				
Flash estimate	4/7/2022	-6.9					
TARGET		Suspended					

Source: IGAE, GSB, SPU and AIReF

AlReF's forecasts for the 2021 deficit were pessimistic, resulting on average in a deficit that was 0.9 points higher than that finally achieved and 0.4 points more accurate than those of the Government. The error incurred in the deficit forecast for 2021 can be explained by the underestimate of the increase in revenue, partially offset by the underestimate of expenditure due to the cost of the measures adopted. Furthermore, the initial forecast of a faster execution of the Recovery, Transformation and Resilience Plan led to substantial changes in the revenue and expenditure forecast.

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⁸ The RTRP defines the Spanish strategy for channelling the funds earmarked by Europe to tackle the economic crisis stemming from COVID-19, through a set of reforms and investments. It was approved by the Council of Ministers on April 27th, 2021, and formally adopted by the European Council on July 13th, 2021.



The error components became fewer in number in successive revisions. Although the total deviation remained stable at around one point of GDP across all reports, the analysis showed larger deviations in the error components during the first two reports, although they offset each other, and were reduced over successive revisions. The larger size of these deviations in the revisions in the year prior to the reference year was due to the uncertainty of the estimates considering the evolution of the pandemic, the impact of the COVID measures being initially limited to 2020 itself and the subsequent introduction of the RTRP.

Revision I Revision 2 Revision 4 Revision 5 Revision 6

Measures Macro Estimate AIREF error OGovernment error

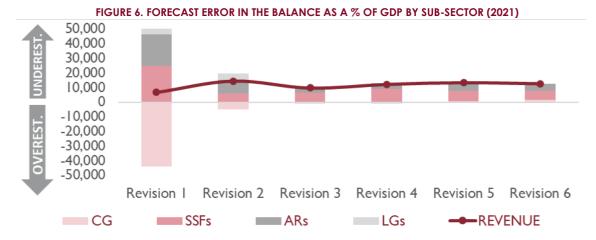
FIGURE 5. FORECAST ERROR IN THE BALANCE AS A % OF GDP BY COMPONENT (2021)

Source: IGAE, GSB, SPU and AIReF

Note: A positive deviation means that a smaller fiscal balance, and hence a larger deficit, is expected than in the flash estimate (pessimistic deviation). Overestimate indicates that a smaller deficit is expected (optimistic deviation).

The analysis by sub-sector shows that forecast errors were concentrated in the Social Security Funds. This was due to the underestimate of contributions and a higher transfer from the State at year-end than had been anticipated, resulting in a lower deficit in this sub-sector than forecast in previous reports. For the remaining sub-sectors, the error components almost fully offset each other after the first two revisions. The largest deviations occurred in the first reports issued in 2020, due to the lack of information at that time for the correct estimate of transfers between the sub-sectors in 2021.





Source: IGAE and AIReF

Note: A positive deviation means that a smaller fiscal balance, and hence a larger deficit, is expected than in the flash estimate (pessimistic deviation). Overestimate indicates that a smaller deficit is expected (optimistic deviation).

Compared with the forecasts made by institutions and private analysts, AIReF's forecasts were more accurate than the average of the Funcas Spanish Economic Forecast Panel for 20219. Specifically, they were 0.3 points of GDP more accurate in average terms over the revisions considered. With a widespread pessimistic deviation, the deviation of most of the institutions considered was more than one point of GDP, while AIReF's average deviation remained below that threshold.

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⁹Analistas Financieros Internacionales (AFI); Axesor Rating; BBVA Research; CaixaBank Research; Spanish Chamber of Commerce; Cemex; Centro de Estudios Economía de Madrid (CEEM-URJC); Centro de Predicción Económica (CEPREDE-UAM); CEOE; Equipo Económico (Ee); Funcas; Instituto Complutense de Análisis Económico (ICAE-UCM); Instituto de Estudios Económicos (IEE); Intermoney; Mapfre Economics; Metyis; Oxford Economics; Repsol; Universidad Loyola Andalucía; YGroup Companies.



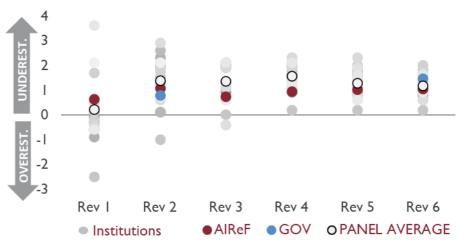


FIGURE 7. FORECAST ERROR (%GDP): COMPARISON WITH OTHER INSTITUTIONS (2021)

Source: IGAE, GSB, SPU, AIReF and Funcas.

Note: A positive deviation means that a smaller fiscal balance, and hence a larger deficit, is expected than in the flash estimate (pessimistic deviation). Overestimate indicates that a smaller deficit is expected (optimistic deviation).

2.1.1. Revenue

AIReF showed a pessimistic deviation when estimating the revenue for 2021, basically due to an underestimate of taxes and social contributions, making an average error of 1.3 points of GDP. This pessimistic deviation was mainly due to the error caused in the revenue forecast exercise, partially mitigated by the deviation in the opposite direction due to the regulatory measures and, to a lesser extent, by those produced by AIReF's macroeconomic forecasts.

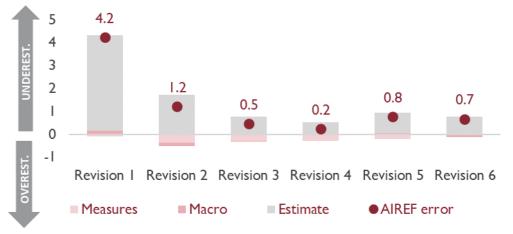


FIGURE 8. FORECAST ERROR IN REVENUE % GDP BY COMPONENT (2021)

Source: IGAE and AIReF

Note: A positive deviation means that lower revenue is forecast than the flash estimate and a negative deviation means that higher revenue is forecast.



The overestimate in the execution of the RTRP offset the underestimate in taxes and social contributions. The analysis by heading and level identifies two areas of error in AIReF's revenue forecasts that counteract each other for the reference year 2021. On the one hand, there was an underestimate of taxes and social contributions, while on the other hand, there was an overestimate of the revenue from the RTRP, included under the heading of other revenue. The first estimate made for 2021 (Revision 1) was made in May 2020 for AIReF's Report on the SPU, which limited its forecast horizon to the current year and the following year and was merged with the initial budget report. This estimate showed the largest deviation as it was made in a shifting scenario determined by the severity and extent of successive waves of the coronavirus pandemic. The error was substantially reduced as from the second estimate (Revision 2) made in November 2020, related to the Report on the Main Lines of the 2021 GSB, which incorporated the impact of the RTRP for the first time.

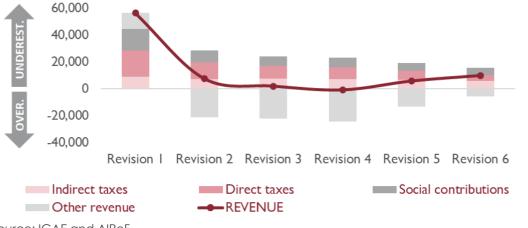


FIGURE 9. FORECAST ERROR IN REVENUE IN €M BY HEADING (2021)

Source: IGAE and AIReF

Note: A positive deviation means that lower revenue is forecast than the flash estimate and a negative deviation means that higher revenue is forecast.

In the case of taxes and social contributions, during the pandemic and subsequent recovery there was a decoupling between the evolution of the tax collection of the main items and the macroeconomic variables linked to each of them. This was reflected in growth in the historical elasticities to changes in economic activity, denoting greater recovery in tax revenue than in the economy. Given that AIReF's forecasting models correct the deviations from the historical average, the persistence of these misalignments over the successive quarters of 2021 caused an underestimate of the forecasts, due to the variability of revenue not explained by economic activity, which in the specific case of Corporate Income Tax



and VAT revenue was estimated by AIReF at 0.4 points of GDP¹⁰. In the case of social contributions, as described in the previous paragraphs on taxes, the misalignment observed between the macroeconomic variables and tax collection meant that the elasticity of the aggregate regarding the compensation of employees was much higher than the historical elasticities, which led to an underestimate of these elasticities. Conversely, the tax cuts approved to alleviate the escalation of energy prices came into force in July 2021 and represented an additional source of error in the estimates made in the previous reports, which, however, by lowering tax collection, partially offset the error in the estimate of taxes.

AlReF overestimated other revenue by forecasting higher execution of the RTRP in 2021. With regard to the RTRP, with an initial estimate of 2.8 points of GDP introduced in the Report on the Main Lines of the 2021 GSB (Revision 2), the successive reports gradually lowered the plan's expenditure and revenue estimates due to the low performance of final spending deduced from the information available over the course of the year, which led to an overestimate of the execution forecast for 2021 in the previous reports.

2.1.2. Expenditure

AlReF's forecasts showed, on average, a deviation of 0.3 points above the spending finally recorded in 2021, discounting the first estimate, which did not yet include the RTRP. The deviation of the estimate procedures was offset by the underestimate due to the approval of new measures, accentuated in the central reports (Revisions 2 to 5) by the denominator effect, produced by a higher estimate of GDP than finally recorded.

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¹⁰ AIReF has performed an analysis of the factors that led to an increase in tax collection over the 2019-2022 period (See <u>Technical Paper 2/23</u>). This technical paper analyses the decoupling between tax bases and macroeconomic variables and evaluates it by means of an unexplained variability component, which contains the growth in revenue that cannot be explained by other variability factors. In 2021, there was an increase in this unexplained variability component amounting to 0.2 points of GDP in the case of Corporate Income Tax and a further 0.2 points of GDP for VAT.





FIGURE 10. FORECAST ERROR IN EXPENDITURE % GDP BY COMPONENT (2021)

Source: IGAE and AIReF

Note: A positive deviation means that lower expenditure than in the flash estimate is expected and a negative deviation means that higher expenditure is expected.

The error due to the measures decreased as their adoption by governments became known. The first report on 2021 took place in early May 2020, at a time when the extension of COVID measures beyond 2020 was not foreseen, explaining a deviation in the forecast of 3.6 points below its final value. The error due to the allocation of measures decreased in the successive forecasts, as extensions and new measures were announced. At the same time, the overestimate of the RTRP, concentrated in gross fixed capital formation, led to a deviation in spending as from the second revision that offset the underestimate caused by the measures. In addition, at year-end a significant volume of unforeseen expenditure associated with non-recurring items such as deferred tax credits or the allocation of defaults on COVID guarantees in 2021 was allocated, which had an impact on a further underestimate of expenditure in previous reports.

By heading and in millions of euros, the overestimate of spending on gross fixed capital formation, linked to the RTRP, stood out, whose deviation decreased over the course of the successive revisions. In contrast, social transfers in cash were higher at the end of the year than expected, both due to the extension of the ERTEs [job-retention schemes] and support for the self-employed, and due to the price pressures that entailed an additional cost as pensions were increased by the CPI for the year (2.5%) instead of the 0.9% at which they were initially increased (colloquially known as the "paguilla de las pensiones").



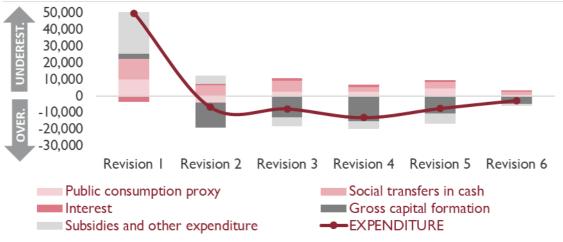


FIGURE 11. FORECAST ERROR IN EXPENDITURE IN €M BY HEADING (2021)

Source: IGAE and AIReF

Note: A positive deviation means that lower expenditure than in the flash estimate is expected and a negative deviation means that higher expenditure is expected.

2.2. Forecast errors for 2022

The fiscal forecasts for 2022 continued to be marked by a situation of strong uncertainty associated in this case with the price hikes and energy crisis, exacerbated by the outbreak of the war in Ukraine, and the measures taken to mitigate its effects. During 2022, with the economic situation still conditioned by the pandemic and affected by the energy crisis and supply problems for agricultural and industrial products that began in 2021, tensions in global value chains and commodities markets intensified following Russia's invasion of Ukraine in February 2022, leading to a sharp rise in inflation and a tightening of financing conditions for the economy. At the same time, the recovery in service activities, in particular the strong performance of tourism, boosted employment growth and economic activity.

In these circumstances, the fiscal forecasts for 2022 were marked by conflicting factors:

- The acceleration of inflation and the associated change in monetary policy.
- The successive extensions of the measures approved since 2021 and new measures to alleviate the effects of the energy crisis and the economic and social consequences of the war in Ukraine and price rises.
- The pace of execution of the RTRP.
- The intensity of tax revenue growth, which in 2022 reached an all-time high, with tax bases that

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continued to grow by more than the Spanish National Accounts indicators.

TABLE 2. 2022 FORECAST OF THE BALANCE IN SPANISH NATIONAL ACCOUNTS (%GDP)

BALANCE 2022						
Revision	Date	AIReF	Government			
I	5/11/2021	-4.6	-5.0			
2	10/25/2021	-4.8	-5.0			
3	4/7/2022	-4.2				
4	5/12/2022	-4.2	-5.0			
5	7/15/2022	-4.5				
6	10/25/2022	-4.6	-5.0			
Flash estimate	4/5/2023	-4.8				
TARGET		Suspended				

Source: IGAE, GSB, SPU and AIReF

AlReF's forecasts for 2022 turned out to be optimistic, standing on average at 0.3 points below the deficit finally achieved, in contrast to the Government's pessimism which was sustained throughout the year at 5% of GDP, 0.2 points above the final deficit. The error in the deficit forecast for 2022 was mainly due to the fact that the successive extensions approved throughout the year¹¹ to mitigate the consequences of the energy crisis, the invasion of Ukraine and the price rises were not known at the time each report was drawn up. In contrast, there was a pessimistic deviation due to the error in the macroeconomic forecasts. Moreover, during the first two revisions, as the year-end forecast for 2021 was not yet known, the forecast errors for that year accumulated.

As the new measures became known, the error in this component decreased. In this regard, it should be noted that the last measures with an impact on the 2022 deficit were adopted in December 2022 for a significant amount, around 0.3 points of GDP, which would explain the deviation in the last revision. On the other hand, the error due to the underestimate of economic activity persisted throughout all the reports, although in the last revision it was offset by the

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 $^{^{11}}$ Regulatory changes with an impact on 2022 results: Royal Decree-Law 6/2022 of March 29th; Royal Decree-Law 11/2022 of June 25th, Royal Decree-Law 14/2022 of August 1st; Royal Decree-Law 17/2022 of September 20th; Royal Decree-Law 18/2022 of October 18th.



error due to the estimate processes themselves because of a lower balance between expenditure and revenue deviations.

2 0.2 -0.2 0.2 0.0 0 Q -0.6 OVEREST. 0.1 0.2 -0.2 0.6 -2 Revision I Revision 2 Revision 3 Revision 4 Revision 5 Revision 6 ■ Measures ■ Macro ■ Estimate ● AIREF error ● Government error

FIGURE 12. FORECAST ERROR IN THE BALANCE AS A % OF GDP BY COMPONENT (2022)

Source: IGAE, GSB, SPU and AIReF

Note: A positive deviation means that a smaller fiscal balance, and hence a larger deficit, is expected than in the flash estimate (pessimistic deviation). An overestimate indicates that a smaller deficit is expected (optimistic deviation).

The breakdown by sub-sector highlights that forecast errors were concentrated in the Regional Governments. Since the second revision, a lower deficit (higher fiscal balance) than at year-end was forecast. The largest errors occurred in the first reports, drawn up in 2021, where estimate errors from the previous year-end accumulated. In addition, there was still insufficient information available for the correct estimate of transfers between subsectors. Over the course of the following revisions, the deviations decreased, with the optimism in the deficits of the Autonomous Regions and Local Governments tending to be offset by the pessimism in that of the Central Government and Social Security.

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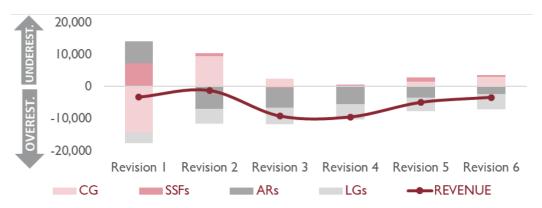


FIGURE 13. FORECAST ERROR IN THE BALANCE AS A % OF GDP BY SUB-SECTOR (2022)

Source: IGAE and AIReF

Note: A positive deviation means that a smaller fiscal balance, and hence a larger deficit, is expected than in the flash estimate (pessimistic deviation). An overestimate indicates that a smaller deficit is expected (optimistic deviation).

A comparison with the Funcas Spanish Economic Forecast Panel for 2022¹² highlights that AIReF's forecasts were more accurate for that year as well. Specifically, 0.4 points of GDP more accurate in average terms over the course of the revisions considered. The widespread nature of the deviation of most of the institutions considered had a pessimistic tone compared with AIReF's optimism, resulting in many cases more than one point of GDP during the first revisions, while AIReF's deviation remained below that threshold in all the reports.

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¹²Analistas Financieros Internacionales (AFI); Axesor Rating; BBVA Research; CaixaBank Research; Spanish Chamber of Commerce; Cemex; Centro de Estudios Economía de Madrid (CEEM-URJC); Centro de Predicción Económica (CEPREDE- UAM); CEOE; Equipo Económico (Ee); EthiFinance Ratings; Funcas; Instituto Complutense de Análisis Económico (ICAE-UCM); Instituto de Estudios Económicos (IEE); Intermoney; Mapfre Economics; Metyis; Oxford Economics; Repsol; Universidad Loyola Andalucía.



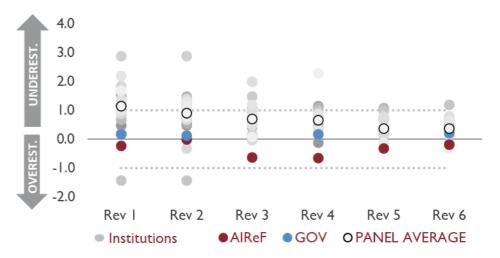


FIGURE 14. FORECAST ERROR (%GDP): COMPARISON WITH OTHER INSTITUTIONS (2022)

Source: IGAE, GSB, SPU, AIReF and Funcas.

Note: A positive deviation means that a smaller fiscal balance, and hence a larger deficit, is expected than in the flash estimate (pessimistic deviation). An overestimate indicates that a smaller deficit is expected (optimistic deviation).

2.2.1. Revenue

AlReF overestimated its forecasts for 2022 revenue after incorporating the 2021 year-end data. The first estimates made for 2022 (Revisions 1 and 2) accumulated the previous year's estimate errors. As from the incorporation of year-end 2021 (Revision 3), there is an optimistic deviation of all the error components. The optimistic nature of the rest of the revisions was marked by the subsequent approval of new tax reduction measures, the forecast of higher execution of the RTRP and the pessimism of the macroeconomic forecasts that generated a deviation of an inverse nature in terms of weight of GDP.

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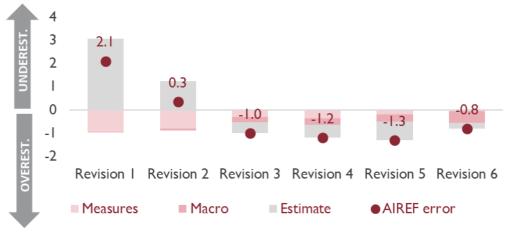
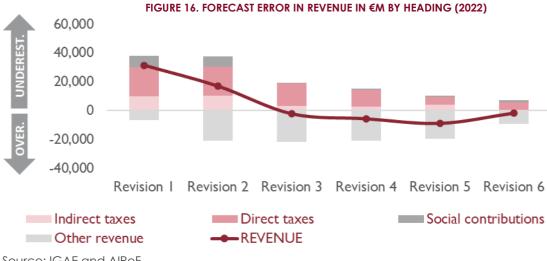


FIGURE 15. FORECAST ERROR IN REVENUE % GDP BY COMPONENT (2022)

Source: IGAE and AIReF

Note: A positive deviation means that lower revenue is forecast than the flash estimate and a negative deviation means that higher revenue is forecast.

The analysis by heading reveals an underestimate of taxes throughout the successive revisions, which was offset by an overestimate of other revenue from the RTRP. Social contributions showed no significant deviations except in the first estimates, influenced by the error arising from the previous year's underestimate.



Source: IGAF and AIReF

Note: A positive deviation means that lower revenue is forecast than the flash estimate and a negative deviation means that higher revenue is forecast.

In the case of taxes, the decoupling between the evolution of the tax collection of the main tax items and the macroeconomic variables linked to their evolution was sustained in 2022. This led to an underestimate due to the variability of revenue not explained by economic activity, which in the specific case of Corporate Income Tax and VAT, revenue has been estimated by AIReF at 0.3 points of GDP¹³.

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The deviation of other revenue was due to the overestimate of the RTRP, whose rate of execution turned out to be lower than initially forecast.

2.2.2. Expenditure

AlReF overestimated General Government expenditure for 2022 from the third revision onwards. In the first reports, lower expenditure than was finally recorded was forecast because of the errors accumulated due to the underestimate of the previous year's expenditure, but, as from the incorporation of the flash estimate on the year-end 2021 accounting (Revision 3), expenditure was overestimated.

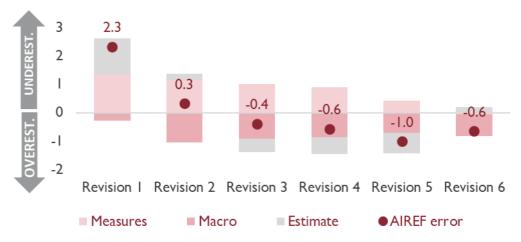


FIGURE 17. FORECAST ERROR IN EXPENDITURE % GDP BY COMPONENT (2022)

Source: IGAE and AIReF

Note: A positive deviation means that lower expenditure than in the flash estimate is expected and a negative deviation means that higher expenditure is expected.

The overestimate was mainly because of macroeconomic forecasts during all the revisions. The denominator effect produces higher values in terms of weight of GDP because of the underestimate of nominal GDP. As in the case of revenue, the magnitude of the error due to regulatory measures decreased over the course of successive revisions, as the impact of the new measures adopted in the year took hold.

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¹³ AIReF's analysis of the variability of tax revenue (See <u>Technical Paper 2/23</u>) reveals that in 2022 the unexplained variability component accounted for just under 0.1 points of GDP of the increase in Corporate Income Tax and just under 0.3 points of GDP of the increase in VAT.



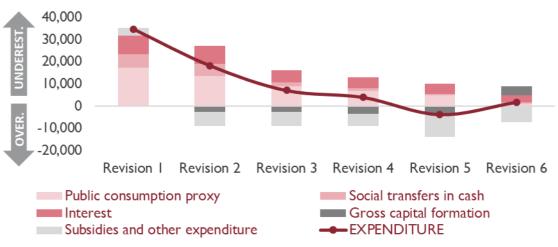


FIGURE 18. FORECAST ERROR IN EXPENDITURE IN €M BY HEADING (2022)

Source: IGAE and AIReF

Note: A positive deviation means that lower expenditure than in the flash estimate is expected and a negative deviation means that higher expenditure is expected.

The analysis by heading and by level (million Euros) shows that the overestimate mainly occurred in subsidies and other expenditure, influenced by the overestimate of the RTRP. In contrast, there was an underestimate of public consumption which was gradually corrected until it disappeared in the last report and an underestimate of interest that persisted throughout all the revisions (see page 45, TABLE 5).

2.3. Evolution of forecast errors 2016-2022

Over the 2016-2022 period, AIReF's deficit forecasts were between 0.2 points lower than the flash estimate and 0.3 points higher, improving the average of the Government's forecasts by 0.2 points. From the average of the deviations in each of the reports (revisions) issued in the seven reference years analysed, the components of the error decreased as the revisions progressed and tended to offset each other. With the inclusion of the forecasts for the last two years (2021 and 2022), the deviations of the individual components increased, although they became more balanced overall. The pessimism due to the estimate procedures was counteracted by subsequent government action and, to a lesser extent, by the optimism of the macroeconomic forecasts.

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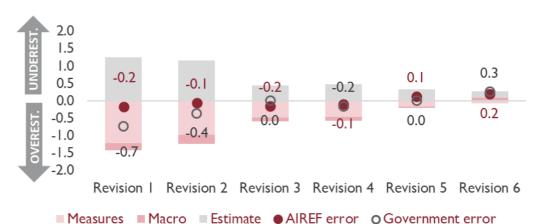


FIGURE 19. AVERAGE ERROR 2016-2022 DEFICIT FORECAST AS %GDP

Source: IGAE, GSB, SPU and AIReF

Note: A positive deviation means that a smaller fiscal balance, and hence a larger deficit, is expected than in the flash estimate (pessimistic deviation). Overestimate indicates that a smaller deficit is expected (optimistic deviation).

The inclusion of two additional years sustains the conclusion that there are no relevant biases. Over the seven years analysed, the estimates showed alternating optimistic and pessimistic deviations with no significant biases. The percentage of occasions on which AIReF made a pessimistic deviation in the fiscal balance was 42% compared with 58% in which it was optimistic, resulting in a balanced distribution, while the Government made a pessimistic deviation 48% of the time. But if we bear in mind that the deviation is conditioned by the year under study and by the number of revisions considered 14, AIReF's average deviation was pessimistic in three of the seven years analysed and was more balanced than that of the Government, which was pessimistic in two of the five years. AIReF was pessimistic in all the revisions in two of the years analysed and optimistic in another two, alternating in the remaining years.

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¹⁴ Government forecasts are only available for Revisions 1, 2, 4 and 6, corresponding to Reports on Draft Budgets and Stability Programme Updates (SPU).

42%

58%



TABLE 3. DEVIATION OF THE BALANCE IN % GDP 2016-2022

Deviation Sign

PERCENTAGE

Rev 16 17 18 19 20 21 22 Deviation

AIReF								Pessi-	Opti-
								mistic	mistic
ı	-	+	-	-		+	-	2	4
2	-	+	-	-		+	+	3	3
3	-	+	-	-	-	+	-	2	5
4	-	+	-	-	-	+	-	2	5
5	-	+	+	-	+	+	-	4	3
6			+	-	+	+	-	3	2
то	TOTAL							16	22

	Government								Opti- mistic
1	-	-	-	-			+	ı	4
2	-	+	-	-		+	+	3	3
3									
4	-	+	-	-	-	+	+	3	4
5									
6			+	-	+	+	+	4	I
то	TOTAL						Ш	12	
PER	PERCENTAGE						48%	52%	

Dev	iation i	in %of	GDP
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	Average							
ı	-0.7	0.1	-0.2	-0.6		0.6	-0.2	-0.2
2	-0.5	0.1	-0.2	-0.9		1.1	0.0	-0.1
3	-0.4	0.1	-0.1	-0.8	0.0	8.0	-0.6	-0.2
4	-0.5	0.3	-0.I	-0.7	0.0	1.0	-0.6	-0.1
5	-0.4	0.2	0.1	-0.8	1.0	1.1	-0.3	0.1
6			0.2	-0.7	0.6	1.1	-0.2	0.2
Average	-0.5	0.2	-0.1	-0.7	0.4	0.9	-0.3	0.0

Rev. | 16 | 17 | 18 | 19 | 20 | 21 | 22 |

	Average							
I	-1.7	-0.2	-0.4	-1.5			0.2	-0.7
2	-1.8	0.0	-0.3	-1.1		8.0	0.1	-0.4
3								0.0
4	-0.9	0.0	-0.4	-0.8	-0.7	1.6	0.2	-0.2
5								0.0
6			0.1	-0.8	0.3	1.5	0.2	0.3
Average	-1.5	-0.1	-0.3	-1.0	-0.2	1.3	0.2	-0.2

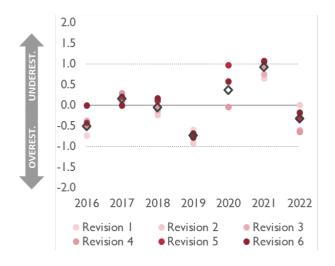
Source: IGAE, GSB, SPU and AIReF

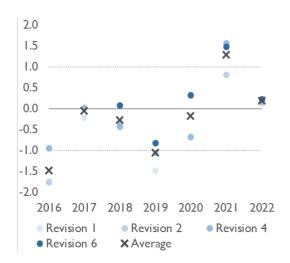
Quantitatively, AIReF's forecasts were better than the Government's, both in average terms for the whole period and for each year except 2017 and 2020.

As regards their magnitude, AIReF's deviations remained below one percentage point of GDP on 89% of occasions (34 out of 38 revisions) while those of the Government did so in 74% of its reports (6 out of 23 revisions). Finally, 2019 and 2021 were the years with the largest deviations in AIReF's case, with 2016, 2019 and 2021 being the years with the largest errors for the Government.



FIGURE 20. DEVIATION OF THE BALANCE AS % OF GDP IN SUCCESSIVE REVISIONS
FIGURE 20.A. AIREF
FIGURE 20.B. GOVERNMENT





Source: IGAE, GSB, SPU and AIReF

Note: A positive deviation means that a smaller fiscal balance, and hence a larger deficit, is expected than in the flash estimate (pessimistic deviation). An overestimate indicates that a smaller deficit is expected (optimistic deviation).

2.0 1.3 1.5 × 1.0 0 0.4 0.9 0.2 0.5 0.2 0 -0. I × 0.0-0.5 × -0.7 -0. I -0.5 💠 -0.2-0.3 -0.3 -1.0-1.5 × -1.0 -1.5 X -2.0 2016 2018 2020 2022 ♦ Average AIReF × Average Government

FIGURE 21. DEVIATION OF THE BALANCE AS % OF GDP: AVERAGE 2016-2022

Source: IGAE, GSB, SPU and AIReF

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2.3.1. Revenue

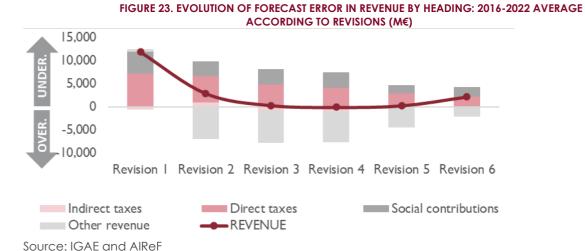
The error in the revenue forecast decreased in 2022, following increases in 2020 and 2021. The error arising from AIReF's models for the forecast of both the macroeconomic scenario and revenue (macro error + estimate error) decreased over the successive updates, with the underestimate of revenue that occurred from 2021 onwards standing out, with a clear decrease in 2022, especially as from the incorporation of the previous year-end data (Revision 3).

5 3 2 - | OVEREST. -2 2016 2017 2018 2019 2020 2021 2022 -Revision 2 Revision 3 Revision I Revision 5 Revision 4 Revision 6

FIGURE 22. MODELLING ERROR (MACRO ERROR + ESTIMATION ERROR) IN THE 2016-2022 REVENUE FORECASTS (% GDP)

Source: IGAE and AIReF

Note: A positive deviation means that lower revenue is forecast than the flash estimate and a negative deviation means that higher revenue is forecast.



Note: A positive deviation means that lower revenue is forecast than the flash estimate and a negative deviation means that higher revenue is forecast.



The materialisation of elasticities in 2021 and 2022 well above their historical values led to an underestimate of tax collection and social contributions in these years. The analysis over the years analysed highlights that the deviations in the revenue forecasts up to 2019 alternated, but as from 2020 they showed a negative deviation that peaked in 2021 and decreased in 2022. This was particularly strong in 2021, both in absolute and relative terms, and declined in 2022 for all items except direct taxes. Indirect taxes showed a change in the sign of the deviation from overestimate until 2020 to underestimate as from 2021. This has been analysed in more detail in the technical paper on the Variability of Tax Revenue¹⁵. Social contributions also showed an underestimate that was accentuated during the pandemic but was reduced in the last year analysed. Finally, the deviations of other revenue, which showed neither a positive nor a negative bias until 2020, have shown an overestimate since the introduction of the RTRP.

30,000 20.000 10,000 0 10,000 2,016 2,017 2,018 2,019 2,020 2,021 2,022 Indirect taxes Direct taxes Social contributions Other revenue **→**REVENUE

FIGURE 24. EVOLUTION OF THE FORECAST ERROR IN THE REVENUE BY HEADING: AVERAGE OF REVISIONS IN EACH YEAR (€M)

Source: IGAE and AIReF

Note: A positive deviation means that lower revenue is forecast than the flash estimate and a negative deviation means that higher revenue is forecast.

TABLE 4. AVERAGE RELATIVE ERROR 2016-2022 BY REVENUE HEADING (%)

	Average relative error							
	REVENUE	Indirect Direct		Social	Other			
	KEVENOL	taxes	taxes	cont.	Other			
Average	0.5	-0.5	3.0	1.9	-7.2			
2016	-2.0	-2.4	-0.4	-0.7	-8.6			
2017	-0.7	-1.8	2.3	0.7	-9.4			
2018	0.8	-0.9	2.1	0.6	2.6			
2019	-0.7	-4.5	-3.0	0.8	10.1			
2020	2.5	-1.6	4.7	5.4	-1.4			
2021	2.6	4.9	7.2	4.8	-19.1			
2022	0.9	3.1	8.0	1.8	-24.6			
Av. Str.	100.0	29.4	26.5	32.2	11.9			

Source: IGAE and AIReF

HSee Technical Document 2/23



2.3.2. Expenditure

On average, AIReF tended to underestimate the level of expenditure, with larger deviations since 2020 mainly due to the adoption of a high number of measures over the course of the year. The evolution of expenditure depends to a lesser extent on the macroeconomic evolution and more on the discretionary criteria of the General Government. Expenditure was underestimated until the second revision in 2021, with a shift towards more optimistic deviations after the incorporation of the year-end data for that year.

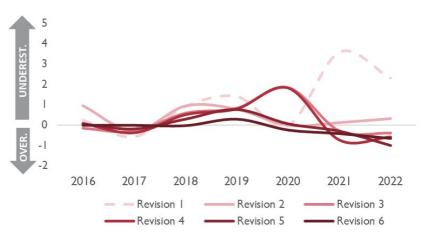


FIGURE 25. EXPENDITURE FORECAST ERROR 2016-2022 (% GDP)

Source: IGAE and AIReF

Note: A positive deviation means that lower expenditure than in the flash estimate is expected and a negative deviation means that higher expenditure is expected.

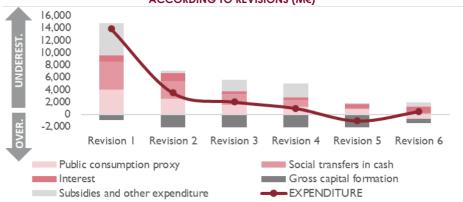


FIGURE 26. EVOLUTION OF THE FORECAST ERROR IN EXPENDITURE BY HEADING: AVERAGE 2016-2022 ACCORDING TO REVISIONS (M€)

Source: IGAE and AIReF

Note: A positive deviation means that lower expenditure than in the flash estimate is expected and a negative deviation means that higher expenditure is expected.



The adoption of measures taken during the year explains almost 50% of the average underestimate of expenditure between 2020 and 2022. The uncertainty associated with the economic, social, and political context has also passed through to the expenditure forecasts through the measures tiers of government have taken as risks materialised. In the first instance, measures to mitigate the effects of COVID were extended in 2020 and 2021. Subsequently, accelerating inflation, with a particular impact on energy and food, exacerbated by the impact of Russia's invasion of Ukraine, led to the adoption of successive packages of measures from the second half of 2021. In addition, inflation also had an impact on expenditure through different channels and headings: interest, social transfers, public consumption, etc.

By heading and in millions of euros, an underestimate of the expenditure headings was observed on average, except for gross fixed capital formation, influenced by the overestimate of the RTRP. The analysis over the years analysed highlights the underestimate of expenditure since 2018, which became more pronounced in 2022 for all headings except subsidies and other expenditure. The average underestimate of expenditure amounted to 0.5% of its level on average over all the forecasts analysed from 2016 to 2022. In terms of magnitude, the deviation in relative terms for subsidies and other expenditure in 2020, gross fixed capital formation in 2021 and interest spending in 2022 are noteworthy. As regards subsidies, the underestimate in 2020 was due to the concentration of many of the non-recurrent expenditure operations (such as the SAREB reclassification, court rulings and adjustments). For its part, the larger error in gross fixed capital formation in 2021 was due to the overestimate of the RTRP. Finally, the underestimate of spending to service debt in 2022 is due to inflation and interest rate rises throughout that year.

20,000

10,000

10,000

2016 2017 2018 2019 2020 2021 2022

Public consumption proxy
Interest
Gross capital formation
Subsidies and other expenditure

EXPENDITURE

FIGURE 27. EVOLUTION OF THE FORECAST ERROR IN EXPENDITURE BY HEADING: AVERAGE OF REVISIONS IN EACH YEAR (€M)

Source: IGAE and AIReF

Note: A positive deviation means that lower expenditure than in the flash estimate is expected and a negative deviation means that higher expenditure is expected.



TABLE 5. AVERAGE RELATIVE ERROR 2016-2022 BY EXPENDITURE HEADING (%)

		Average relative error									
	EXPENDITURE	CoE	Intermed iate consump tion	Social Trans. in kind	Social Trans. in cash	Interest	GFCF	Subs. and others			
Average	0.5	0.4	0.5	0.0	0.8	1.3	-9.5	3.9			
2016	-0.7	-0.2	-3.0	-1.6	0.6	-0.9	-14.6	4.2			
2017	-1.0	-1.0	0.2	-1.3	0.6	-0.3	-6.5	-7.6			
2018	0.8	0.4	1.5	0.4	0.5	4.7	-6.2	4.3			
2019	1.0	1.3	2.3	3.5	0.6	-2.6	-1.8	2.8			
2020	1.2	-1.1	-4.7	-3.7	-0.5	-11.1	-5. I	28.3			
2021	0.3	1.4	0.6	0.4	2.5	1.4	-28.6	3.7			
2022	1.6	1.8	6.8	2.2	1.1	18.1	-3.7	-8.2			
Av. Str.	100.0	25.1	12.0	6.1	37.4	5.6	5.5	8.4			

Source: IGAE and AIReF

The 2022 errors in the forecast of spending to service debt reflect the tightening of monetary policy and rising inflation. The first reports produced in 2021 came at a time of containment of interest rates following the ECB's activation of the Pandemic Emergency Purchase Programme (PEPP). But inflation surprised on the upside during 2022, reaching record highs since the creation of the euro. As a result, central banks around the world reacted with interest rate hikes from the beginning of the year, to curb much higher and more persistent inflation than initially anticipated. This resulted in a turning point in the evolution of rates and a continuous upward revision of interest spending forecasts, which, even so, stood at higher levels than initially anticipated at year-end. In addition, the rise in inflation was passed on directly to interest spending via the inflation-linked bond portfolio.

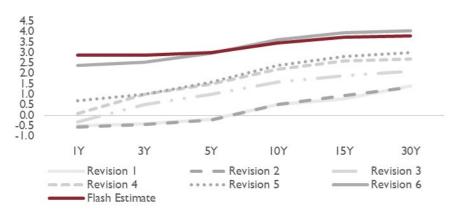


TABLE 6. FINANCING CONDITIONS: EVOLUTION DURING THE AIREF REPORTS RELATING TO 2022

Report	Financing conditions
	2021
Revision 1 2021-2024 SPU 11/05/2021	The ECB increased the pace of debt purchases under the Pandemic Emergency Purchase Programme (PEPP), leading to the containment of long-term interest rates.
Revision 2 Draft Budget 2022 25/10/2021	The ECB moderated the pace of its asset purchases and signalled the progressive withdrawal of the stimulus measures over 2022. 2022
Revision 3 Initial Budgets 2022 04/07/2022	 Interest rates close to historical lows at year-end 2021. The Bank of England and the US Federal Reserve raised their reference rates.
Revision 4 2022-2025 SPU 12/05/2022	- The Bank of England and the US Federal Reserve raised their reference rates on 4 and 2 occasions, respectively The ECB announced increases after the summer.
Revision 5 Budgetary execution 2022 15/07/2022	 The confirmation that inflation is proving to be more intense and persistent than anticipated. The ECB finalised its purchasing programmes The first rise in interest rates occurred.
Revision 6 Draft Budgets 2023 25/10/2022	Rising interest.
1st Observation Initial Budgets 2023 05/04/2023	Consolidated trend change

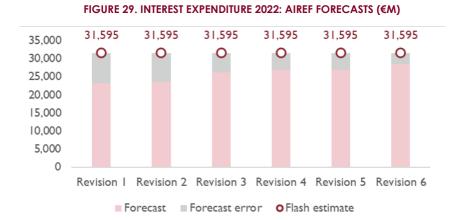
Source: Prepared by AIReF

FIGURE 28. SPANISH DEBT YIELD CURVE: EVOLUTION (%)



Source: Refinitiv





Source: IGAE and AIReF

3. CONCLUSIONS

The Spanish economy maintained some resilience in 2022 which is reflected in an estimate of GDP growth that turned out to be higher than AIReF's spring forecast for that year. This result extends to the main demand aggregates. In 2022 the economy was subject to unusual shocks associated with the persistence of the pandemic and its economic implications and the outbreak of the war in Ukraine, which brought with it an energy crisis that accentuated supply problems in value chains and rising inflation. Despite this, the GDP growth observed was higher than AIReF had expected a year earlier. According to the analysis performed, neither the revision of the Spanish National Accounts figures for 2021 (carry-over effect) nor the incorporation of observed data on external assumptions are sufficient to explain this result. In this regard, the good performance shown by exports of goods and services once the currently available Spanish National Accounts information is considered and what the models would have estimated with the information observed on the external assumptions stands out. The same happens in the case of investment in equipment, whose higher growth than estimated could reflect the take-off of investments associated with the RTRP.

At a budgetary level and in comparison, with other institutions, AIReF's deficit forecasts were more accurate on average in both 2021 and 2022. Moreover, in 2022 the widespread nature of the deviation of most institutions considered

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(pessimistic) was of the opposite sign to AIReF's deviation (optimistic). AIReF's deviation during the two years analysed remained among the five most accurate and its average error remained below the threshold of ± 1 points of GDP.

Taking the period 2016-2022 as a reference in general, the characteristics of AIReF's forecasts according to the statistics habitually used to analyse the quality of the forecasts are satisfactory. No statistically significant biases are discernible for the current year, except for employment, the errors are in no case persistent and the estimates made by AIReF substantially improve on a naive estimate. Moreover, AIReF was accurate in terms of most of the turning points in GDP growth, the rest of the aggregates and employment. Compared with other institutions, there are still no significant differences between the biases and accuracy of the forecasts of the different institutions and AIReF. AIReF continues to forecast GDP growth in the current year with greater certainty, but it is less accurate in forecasting the evolution of the foreign sector in the current year and gross fixed capital formation.

At a budgetary level, the analysis does not identify any significant biases in AIReF's fiscal forecasts over the 2016-2022 period. Over the entire period, the average error was practically zero, with deviations that were offset. Although the deviation of the balance was low on average, in 2021 and 2022 the errors in the expenditure and revenue forecasts continued to be higher than before the pandemic, with the average error in the fiscal balance standing at 0.9 points of GDP in 2021 and 0.3 points of GDP in 2022. In a context characterised by high uncertainty, the errors in 2021 and 2022 were mainly due to three competing factors: the adoption of measures at a later point in time than when the forecasts were made, the materialisation of tax collection elasticities significantly above historical values, and a slower execution of the RTRP than initially foreseen.

AlReF's forecasts were on average more accurate than those of the Government. Although at specific moments the Government's forecasts were more accurate, in general, for all the time horizons analysed, AlReF's forecasts were more accurate and balanced than the Government's, being on average 0.2 points more accurate and with alternating optimistic and pessimistic deviations, which means that there were no significant biases. Even in 2021, when AlReF's forecasts showed the largest deviations, they were 0.4 points more accurate than the Government's forecasts.

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The analysis identified weaknesses in the estimate of certain headings. AIReF continues to work on improving the areas identified. In this regard, it is worth highlighting the exercise in 2023¹⁶ of the breakdown of the variability of the main tax items in order to quantify the different factors that have led to the increase in revenue over the last two years so that it can be used as the basis for analysing the structural or short-term nature of this growth and its impact on AIReF's forecasting tools. AIReF is also looking more closely at the mechanisms for monitoring the regulatory measures that have an impact on the forecasts and at monitoring the execution of the RTRP, although the scant availability of information on the impact of the plan in national accounting terms for the revenue and expenditure of the General Government is beyond the scope of AIReF's monitoring. Lastly, due to its discretionary nature, it is not possible to anticipate the impact of unannounced measures on the forecasts.

¹⁶See <u>Technical Document 2/23</u>



ANNEX I. BREAKDOWN OF THE STATISTICAL ANALYSIS OF THE MACROECONOMIC FORECASTS FOR THE 2016-2022 PERIOD

The evaluation of the statistical quality of the macroeconomic forecasts is made based on the analysis of the forecast errors made in comparison with the observed data. Forecast errors are defined as the difference between the predicted value and the observed value for each of the macroeconomic aggregates considered, so that positive/negative errors imply an over/underestimate. The analysis considers as observed data the first annual estimate obtained with the publication of the INE's Quarterly National Accounts for the last quarter of the year, without taking into consideration the successive revisions that this body performs of the main macroeconomic indicators.

In addition to analysing the errors themselves, an analysis of the forecast errors made in comparison with those of other analysts and agencies is also performed, as this yields relevant information on the nature of these errors. For example, the existence of significant errors, common to all analysts, could reflect the influence of phenomena such as the health crisis that no-one can anticipate or major revisions of the historical figures of the variables to be estimated. In contrast, the possible existence of larger errors or systematic biases in any of the variables considered, compared with the rest of the analysts, could indicate the existence of weaknesses in the tools or methodologies used by AIReF.

This approach has made it necessary to compile a database containing both the forecasts made by AIReF since 2015 - the first year available - and those made by a set of institutions and private analysts since 1999. Given that not all the agencies and institutions produce their forecasts at the same point in time, there could be differences justified by the set of information available. To try to minimise this effect, we have selected the estimates made at two specific moments that mark the main milestones in the budgetary process: the first coincides with the updating of the Stability Programme, which is performed between March and May each year; the second corresponds to the preparation of the Budgetary Plan and the General State Budget, which are generally drawn up between September and October each year. Hereafter, we will refer to these two moments as "spring" (S) and "autumn" (A), respectively.

The variables of analysis are the annual growth forecasts of gross domestic product (GDP) and of the main demand-side aggregates



in volume terms, as well as employment growth, measured through full-time equivalent employment.

The agencies and institutions considered are all those that make up the Funcas Panel, as well as the European Commission, the Bank of Spain, and the Government.

The properties of some of the statistics used could be conditioned by the small sample size, especially when this period includes such an intense shock as COVID, which could not be anticipated. In order not to distort the analysis of the one-year forecasts, the errors made in 2020 are not considered in the analysis, i.e. they are taken as missing values, due to the impossibility of foreseeing the outbreak of COVID and so that they do not alter the quality metrics considered. This adaptation of the available sample does not alter the main conclusions on the quality of the forecasts and does not mask factors that have affected the estimates following the pandemic. Finally, the conclusions are presented.

Analysis of Gross Domestic Product forecasts

The forecast errors made when estimating the GDP growth rate are sustained at low levels until COVID-19, after which they increase, reflecting greater uncertainty. Lower forecast errors are observed in those estimates where more information is available, i.e. in the autumn estimates compared with the spring estimates and the estimates for the current year compared with the following year.

However, the average error made in AIReF's estimates is not significantly different from zero. Until 2018, AIReF's estimates for the current year and the following year forecast lower growth than that observed, so that the Mean Error (ME), as an approximation of the bias, was negative. In the period 2019-2022, the errors for the current year show a slightly positive bias, indicating a certain overestimate of GDP growth. However, this bias is not significant - when tested by estimating a regression of the forecast errors as regards a constant - with a p-value of more than 0.85. For the following year, the mean error enters positive territory in 2021, although it is not statistically different from zero either.

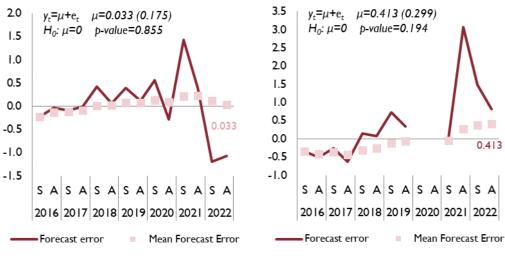


0.413

FIGURE ANNEX I. 1. EVOLUTION OF THE FORECAST ERRORS AND THE MEAN ERROR OF GROSS DOMESTIC PRODUCT ESTIMATES

FIGURE ANNEX I. 1 A. CURRENT YEAR

FIGURE ANNEX I. 1 B. FOLLOWING YEAR



Source: INE and AIReF

The mean squared error of the GDP forecasts for the following year increases because of the impact of the consecutive shocks observed since 2020. As can be seen in Annex I Figure 3, the fact that large errors persist in the following year's estimates is common to all other forecasting agencies, indicating that the loss of accuracy is due to external factors. These include the increased volatility of macroeconomic indicators and hence of the QNA series in the last two years (see Section 1.1 Analysis of macroeconomic forecast errors for the year 2022), uncertainty regarding the evolution of the pandemic and the impact of the measures contained in the RTRP.

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FIGURE ANNEX I. 2. EVOLUTION OF THE MEAN SQUARED ERROR OF THE ESTIMATES AND STANDARD DEVIATION OF GROSS DOMESTIC PRODUCT IN VOLUME TERMS

FIGURE ANNEX I. 2 A. CURRENT YEAR

FIGURE ANNEX I. 2 B. FOLLOWING YEAR



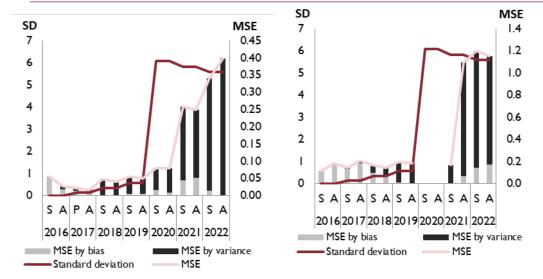
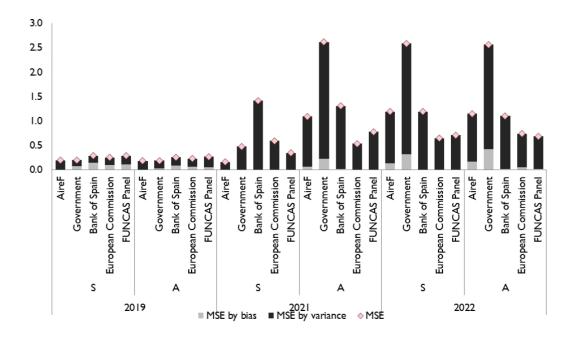


FIGURE ANNEX I. 3. COMPARISON OF THE MEAN SQUARED ERROR OF THE AGENCIES



Source: INE and AIReF

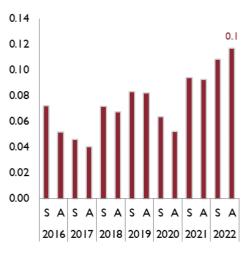
AlReF's forecasts substantially exceed the efficiency of a naive estimate. Theil's U statistic (TU) is used, defining the naive forecast as the latest available observed value. Values of the statistic lower than unity indicate greater accuracy of the estimate compared with the naive forecast and vice versa, with lower values therefore being a sign of greater efficiency. In the GDP forecasts for the current year, the average value of the statistic is much lower than unity; hence AlReF's forecasts are clearly better than the naive estimate. In the estimates for the following year, the statistic shows slightly higher figures, but still well below unity.



FIGURE ANNEX I. 4. EVOLUTION OF THE THEIL'S U-STATISTIC FOR ESTIMATES OF GROSS DOMESTIC PRODUCT IN VOLUME TERMS

FIGURE ANNEX I. 4 A. CURRENT YEAR

FIGURE ANNEX I. 4 B. FOLLOWING YEAR





Source: INE and AIReF

The forecast errors made by AIReF are not persistent over time, both for the current year and for the following year. By testing the significance of the first lag of the simple autocorrelation function of the forecast errors, a sufficiently small value of the test statistic is observed. Consequently, the null hypothesis of no correlation at the 10% significance level cannot be rejected for both the current and following year estimates.

FIGURE ANNEX I. 5. SIMPLE AUTOCORRELATION FUNCTION OF THE FORECAST ERRORS OF GROSS DOMESTIC PRODUCT IN VOLUME TERMS

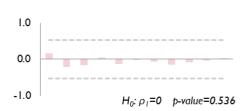


FIGURE ANNEX I. 5 A. CURRENT YEAR

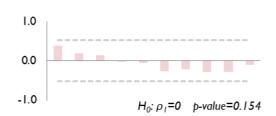


FIGURE ANNEX I. 5 B. FOLLOWING YEAR

Source: INE and AIReF

Analysis of forecasts for demand aggregates

The forecast errors of the demand-side aggregates, both in the current year and in the following year, have a higher variability than GDP, especially in



the components relating to the foreign sector. As seen in the GDP analysis, the outbreak of the pandemic generated larger deviations in the forecasts with respect to the data observed in 2020-2021, and these are much larger in the estimates for the following year. Furthermore, the errors in the autumn forecasts are lower than those in the spring forecasts.

For private consumption, forecast errors are mostly positive, although no statistically significant forecasting biases are apparent in the estimates for the current year. Although in general the mean error is greater than zero throughout the sample, both in the forecasts for the current year and the following year, the regression of the forecast errors shows that the possible optimistic bias is not statistically significant in the forecasts for the current year, but is significant for the following year (see Annex I. Figure 6A and in Annex I. Figure 6B).

AlReF's forecasts reflect an absence of significant bias for the current year and the following year when estimating public consumption. The strong positive deviation in 2020 for the estimates for the current year (see Annex I. Figure 6C and Annex I. Figure 6D), stemming from a forecast increase in spending linked to the measures aimed at mitigating the effects of the pandemic that was ultimately higher than that observed in the first INE estimate, shifts the sign of the mean error in the estimates for the current year into positive territory. At any event, the bias in the estimates for both the current year and the following year is not statistically significant.

Forecasts of gross fixed capital formation have tended to be optimistic since the outbreak of COVID-19. The mean error up to 2020 is slightly positive for the estimates in the current year and the following year. In the estimates for the current year (see Annex I. Figure 6E), with the outbreak of the pandemic, significant negative forecast errors occur, leading to a change of sign in the bias, which has been gradually corrected. However, for the following year (see Annex I. Figure 6F), a more favourable evolution than finally observed since the outbreak of COVID is forecast, due to the expected impact of the Recovery, Transformation and Resilience Plan, which has been postponed, implying downward revisions of its effect in the years 2021 and 2022. This means that the bias for the current year is not significantly different from zero, but a significant non-zero bias appears for the following year.

Exports and imports of goods and services show very similar conduct, with positive mean errors, only until the outbreak of the coronavirus in the case of the estimates for the current year.

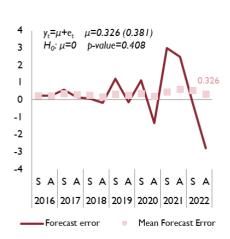


In the estimates for the current year, the upward trend observed until 2020 is reversed thereafter and no significant bias is identified. For the estimates for the following year, this optimism persists in the case of imports of goods and services, increasing the significance of the bias. This more favourable evolution expected for imports in the following year derives from the relationship of this aggregate with gross fixed capital formation, which has been continuously overestimated by the revisions of the expected impact of the RTRP (see Annex I. Figures 6G, 6H, 6I and 6J).

FIGURE ANNEX I. 6. EVOLUTION OF THE FORECAST ERRORS AND THE MEAN ERROR OF THE ESTIMATES OF THE DEMAND AGGREGATES

FIGURE ANNEX I. 6 A. PRIVATE CONSUMPTION CURRENT YEAR

FIGURE ANNEX I. 6 B. PRIVATE
CONSUMPTION FOLLOWING YEAR



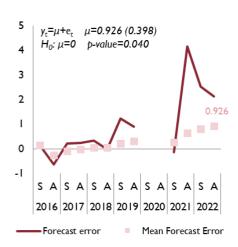
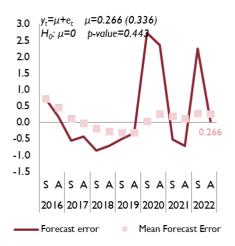


FIGURE ANNEX I. 6 C. PUBLIC
CONSUMPTION CURRENT YEAR

FIGURE ANNEX I. 6 D. PUBLIC
CONSUMPTION FOLLOWING YEAR



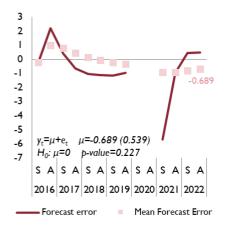




FIGURE ANNEX I. 6 E. GFCF - CURRENT YEAR

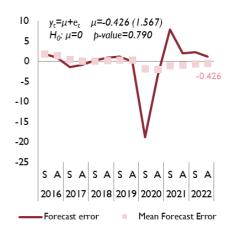


FIGURE ANNEX I. 6 F. GFCF - FOLLOWING YEAR

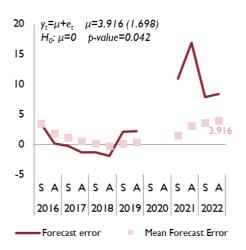


FIGURE ANNEX I. 6 G. EXPORTS OF GOODS AND SERVICES - CURRENT YEAR

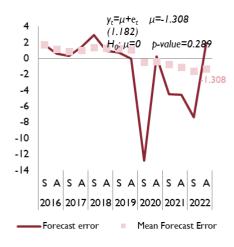


FIGURE ANNEX I. 6 H. EXPORTS OF GOODS

AND SERVICES - FOLLOWING YEAR

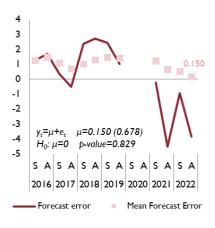


FIGURE ANNEX I. 6 I. IMPORTS OF GOODS AND SERVICES - CURRENT YEAR

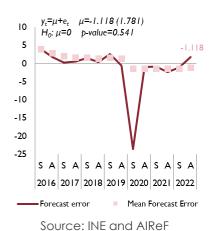
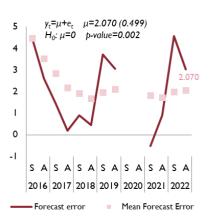


FIGURE ANNEX I. 6 J. IMPORTS OF GOODS AND SERVICES - FOLLOWING YEAR





With some exceptions, mean squared errors either maintain the declining forecast that started after reaching record highs in 2020-2021 due to the outbreak of COVID or suffer increases linked to the higher volatility of accounting aggregates.

This suggests that improvements are taking place in the accuracy of the estimates despite continuing high levels of uncertainty. Among the exceptions is private consumption, where the mean squared error increases due to positive surprises in the estimates for the current year and the opposite for the following year, compared with what was expected, leading to significant errors. The MSE also increases in the estimates of gross fixed capital formation for the following year and, as a one-off, in the spring 2021 forecast of exports for the current year. These patterns of behaviour are common to all agencies, reflecting the existence of exogenous factors that impact the evolution of the aggregates, as mentioned above.

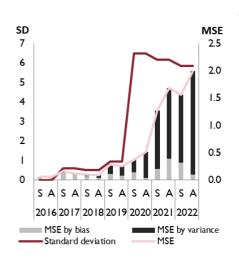
FIGURE ANNEX I. 7. EVOLUTION OF THE MEAN SQUARED ERROR OF THE ESTIMATES AND STANDARD DEVIATION OF THE DEMAND AGGREGATES

FIGURE ANNEX I. 7 A. PRIVATE

CONSUMPTION CURRENT YEAR

FIGURE ANNEX I. 7 B. PRIVATE

CONSUMPTION FOLLOWING YEAR



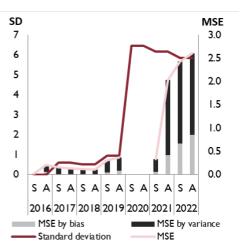


FIGURE ANNEX I. 7 C. PUBLIC
CONSUMPTION CURRENT YEAR

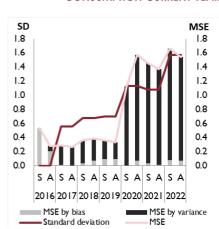


FIGURE ANNEX I. 7 D. PUBLIC
CONSUMPTION FOLLOWING YEAR

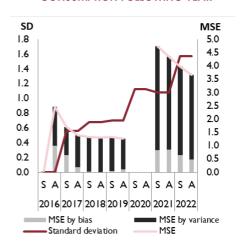




FIGURE ANNEX I. 7 E. GFCF - CURRENT YEAR

SD MSE 8 45 7 40 35 6 30 5 25 4 20 3 15 2 10 I 0 SASASASASASA 2016 2017 2018 2019 2020 2021 2022 MSE by bias ■ MSE by variance Standard deviation MSE

FIGURE ANNEX I. 7 F. GFCF - FOLLOWING YEAR

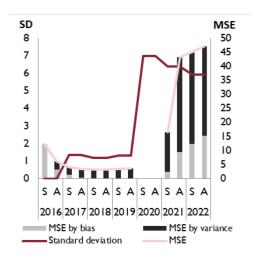


FIGURE ANNEX I. 7 G. EXPORTS OF GOODS AND SERVICES - CURRENT YEAR

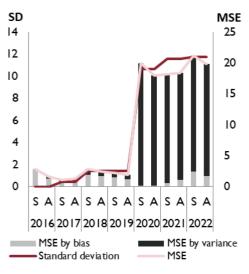


FIGURE ANNEX I. 7 H. EXPORTS OF GOODS

AND SERVICES - FOLLOWING YEAR

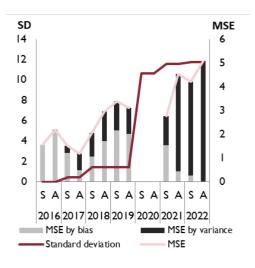


FIGURE ANNEX I. 7 I. IMPORTS OF GOODS AND SERVICES - CURRENT YEAR

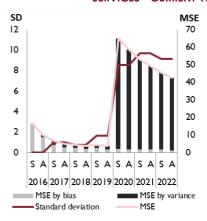
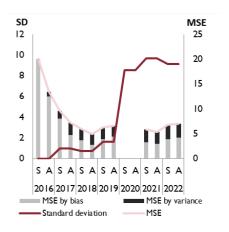


FIGURE ANNEX I. 7 J. IMPORTS OF GOODS AND SERVICES - FOLLOWING YEAR



Source: INE and AIReF



The efficiency of the forecasts changes markedly with the outbreak of the coronavirus and according to the component analysed but is in any case higher than that of a naive estimate. In 2020, due to the greater uncertainty caused by the health crisis, there was a widespread loss of efficiency, with significant increases in the mean value of Theil's U statistic. Subsequently, previous values are resumed or paths of convergence to them are initiated, with current values below unity, except in the following year estimates for gross fixed capital formation, where the loss of efficiency linked to COVID was so intense that, together with the uncertainty regarding the impact of the RTRP, the mean value of Theil's U statistic is maintained above unity in the estimates for the following year. It is worth highlighting the improvement in the efficiency of the forecasts of the foreign sector aggregates for the following year as from the time AIReF started to draw up the forecast evaluation reports.



FIGURE ANNEX I. 8. EVOLUTION OF THE THEIL'S U-STATISTIC FOR THE ESTIMATIONS OF THE DEMAND AGGREGATES

FIGURE ANNEX I. 8 A. CURRENT YEAR

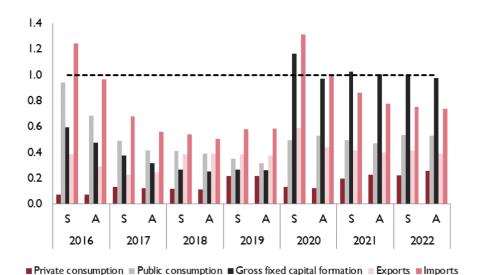
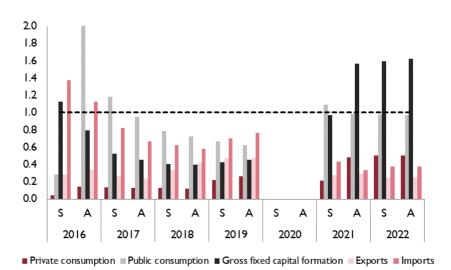


FIGURE ANNEX I. 8 B. FOLLOWING YEAR



Source: INE and AIReF

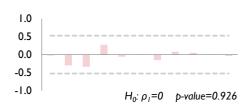
The forecast errors made by AIReF for both the current year and the following year are not persistent over time. The simple autocorrelation functions for the different variables estimated do not show significant lags, except in the case of the following year forecasts for gross fixed capital formation, where positive deviations from the observed data tend to significantly increase the probability of overestimating the evolution of the aggregate. However, the persistent nature of these errors is observed in the rest of the bodies that make forecasts, possibly reflecting overestimates of the conduct of the aggregate linked to the effect of the RTRP whose expected execution has shifted over time.



FIGURE ANNEX I. 9. SIMPLE AUTOCORRELATION FUNCTION OF THE FORECAST ERRORS OF THE DEMAND AGGREGATES

FIGURE ANNEX I. 9 A. PRIVATE CONSUMPTION CURRENT YEAR

FIGURE ANNEX I. 9 B. PRIVATE CONSUMPTION FOLLOWING YEAR



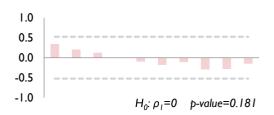
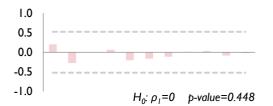




FIGURE ANNEX I. 9 C. PUBLIC CONSUMPTION CURRENT YEAR

FIGURE ANNEX I. 9 D. PUBLIC CONSUMPTION FOLLOWING YEAR



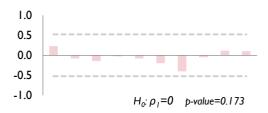
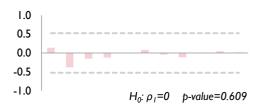


FIGURE ANNEX I. 9 E. GFCF
CURRENT YEAR

FIGURE ANNEX I. 9 F. GFCF FOLLOWING YEAR



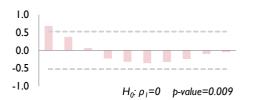
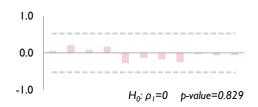


FIGURE ANNEX I. 9 G. EXPORTS OF GOODS AND SERVICES CURRENT YEAR

FIGURE ANNEX I. 9 H. EXPORTS OF GOODS AND SERVICES
FOLLOWING YEAR



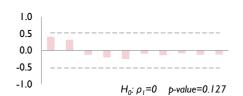
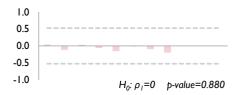
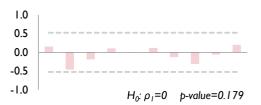


FIGURE ANNEX I. 9 I. IMPORTS OF GOODS AND SERVICES

CURRENT YEAR

FIGURE ANNEX I. 9 J. IMPORTS OF GOODS AND SERVICES
FOLLOWING YEAR





Source: INE and AIReF

The largest contributions to the error in estimating GDP growth are the estimates for the foreign sector, with private consumption and gross fixed capital formation gaining importance in recent years.



In the October 2022 estimates for the current year, private consumption stands out as the main contributor to the detriment of gross fixed capital formation. For the following year, higher contributions from gross fixed capital formation and private consumption are observed.

FIGURE ANNEX I. 10. EVOLUTION OF THE CONTRIBUTIONS TO THE ERROR OF THE DEMAND

AGGREGATES

FIGURE ANNEX I. 10 A. CURRENT YEAR

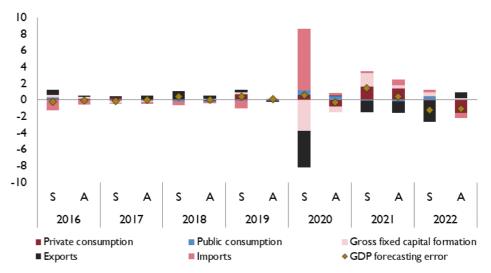
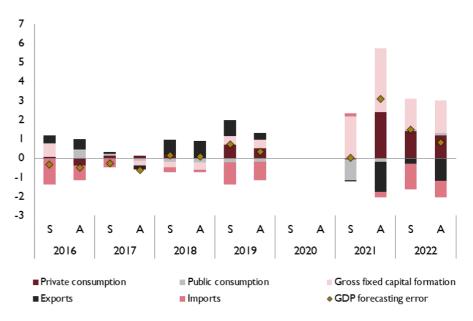


FIGURE ANNEX I. 10 B. FOLLOWING YEAR



Source: INE and AIReF

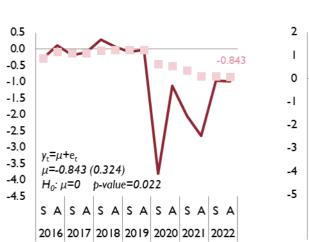
Analysis of employment forecasts

Until 2020, the forecast errors of the current-year estimates of full-time equivalent employment fluctuate around zero, but systematically fall below zero thereafter, with a significant downward bias. In the following year forecasts,



errors with a negative sign predominate, although this bias is not significant.

FIGURE ANNEX I. 11. EVOLUTION OF THE FORECAST ERRORS AND THE MEAN ERROR OF THE FULL-TIME EQUIVALENT EMPLOYMENT ESTIMATES



Mean Forecast Error

FIGURE ANNEX I. 11 A. CURRENT YEAR

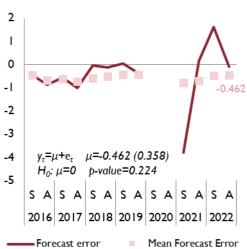


FIGURE ANNEX I. 11 B. FOLLOWING YEAR

Source: INE and AIReF

Forecast error

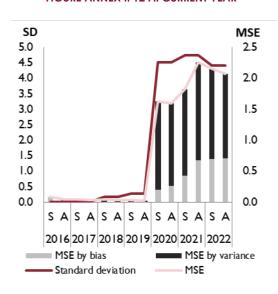
There is a positive progression in the accuracy of the estimates following the outbreak of COVID-19, both for the current year and in the employment estimates for the following year. After the increase in prediction errors caused by the outbreak of the pandemic in 2020 because of the significant increase in the change of the variable, there is a gradual reduction that implies improvements in the accuracy of the estimates, although in the estimates for the current year in 2021 there are also losses in accuracy linked to a greater bias, which have been mitigated in the latest forecasts.

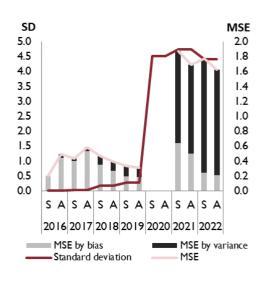


FIGURE ANNEX I. 12. EVOLUTION OF THE MEAN SQUARED ERROR OF THE ESTIMATES AND THE STANDARD DEVIATION OF FULL-TIME EQUIVALENT EMPLOYMENT

FIGURE ANNEX I. 12 A. CURRENT YEAR



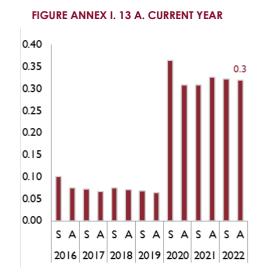




Source: INE and AIReF

AlReF's employment forecasts for the current year are more efficient than a naive forecast. The mean values of Theil's U statistic in the estimates for the current year and the following year are well below unity.

FIGURE ANNEX I. 13. EVOLUTION OF THEIL'S U-STATISTIC FOR ESTIMATES OF FULL-TIME EQUIVALENT EMPLOYMENT





Source: INE and AIReF

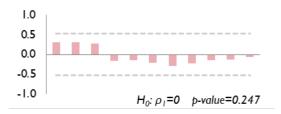
The errors in the employment forecasts are not persistent. The first lag of the autocorrelation functions of the forecast errors in estimating employment is not significant in both the current year's estimates and the following year's forecasts.

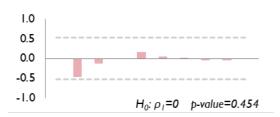


FIGURE ANNEX I. 14. SIMPLE AUTOCORRELATION FUNCTION OF THE FORECAST ERRORS OF FULL-TIME EQUIVALENT EXPENDITURE

FIGURE ANNEX I. 14 A. CURRENT YEAR







Source: INE and AIReF

Comparison of forecast errors with the panel of public and private agencies

This section presents a comparative analysis of the forecasts made both by AIReF itself and by the various agencies considered.

Comparison of gross domestic product forecast errors in volume terms

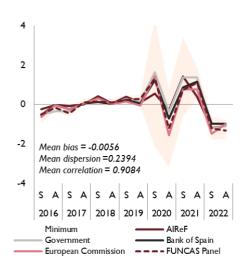
The Gross Domestic Product forecasts of all agencies show similar behaviour, both for the current year and the following year, with biases that are not significantly different from zero. Forecast errors show similar patterns, with clear increases in periods of higher uncertainty, such as during the COVID-19 pandemic. This strong similarity can be seen more clearly when analysing the small dispersion between them and their high correlation, above 90% for the current year forecasts and 60% for the following year forecasts. All the agencies have biases close to zero in the estimates for the current year and positive and larger biases in the estimates for the following year, although they are all statistically non-significant (at 5% significance level). This similarity means that the null hypothesis of equality between the biases of the different institutions and AIReF is not rejected.

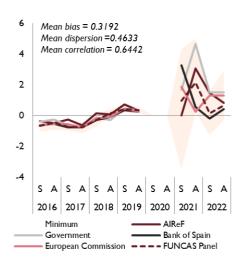


FIGURE ANNEX I. 15. COMPARATIVE FORECAST ERRORS IN ESTIMATES OF GROSS DOMESTIC PRODUCT IN VOLUME TERMS

FIGURE ANNEX I. 15 A. CURRENT YEAR

FIGURE ANNEX I. 15 B. FOLLOWING YEAR





Source: INE, Ministry of Economic Affairs and Digital Transformation, Bank of Spain, FUNCAS and AIReF.

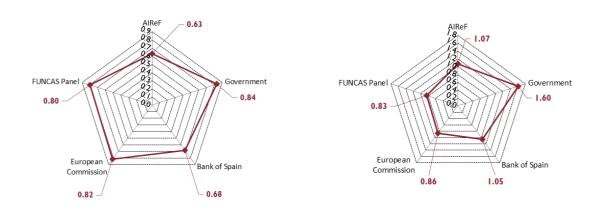
AlReF's forecasts for the current year prove to be the most accurate, although they are not significantly different from those made by other agencies. It should be borne in mind that the outbreak of the pandemic and the other shocks in 2021 and 2022 entail a loss of accuracy in AlReF's estimates for the following year compared with other agencies, although statistically there are no significant differences in accuracy between the different agencies (see ANNEX II Quality measures and tests). All the agencies considered show similar values in the mean value of Theil's U statistic and in the ability to forecast the direction of the rate of change of GDP, although in all the agencies, except AlReF and the Bank of Spain, upward errors for the following year tend to precede more optimistic estimates for the following year.



FIGURE ANNEX I. 16. COMPARISON OF THE MEAN SQUARED ERROR OF ESTIMATES OF GROSS DOMESTIC PRODUCT IN VOLUME TERMS

FIGURE ANNEX I. 16 A. CURRENT YEAR

FIGURE ANNEX I. 16 B. FOLLOWING YEAR



Source: INE, Ministry of Economic Affairs and Digital Transformation, Bank of Spain, FUNCAS and AIReF.

Comparison of forecast errors for demand aggregates in volume terms

The current year forecasts for the demand-side components of GDP show a greater degree of disparity between agencies, more marked in those components with greater variability. The greatest differences between the forecasting agencies are found for the evolution of public consumption and exports in the current year, with average correlations of the forecast errors of the agencies considered exceeding 0.60, and in the estimates of private consumption and the foreign sector for the following year, with correlations greater than half a point. There are no significant biases in the estimates for the current year and no significant differences between the mean error made by the agencies or AIReF. For the following year, there is an increase in the size of the mean error made by the different agencies when estimating the demand components, with no significant biases identified, apart from a few specific exceptions and, in general, when estimating gross fixed capital formation where all the agencies show a significant upward bias. Given that the increase is similar across agencies, the tests between the biases of the different agencies do not reject the null hypothesis of equality at the 5% level of significance (see ANNEX II Quality measures and tests).

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FIGURE ANNEX I. 17. COMPARATIVE FORECAST ERRORS OF ESTIMATES OF DEMAND AGGREGATES IN VOLUME TERMS

FIGURE ANNEX I. 17 A. PRIVATE CONSUMPTION CURRENT YEAR

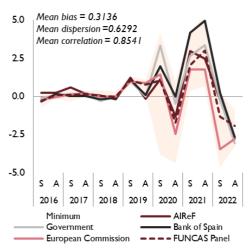


FIGURE ANNEX I. 17 C. PUBLIC CONSUMPTION CURRENT YEAR

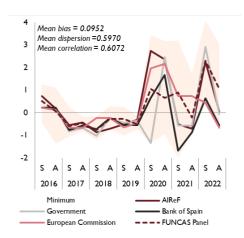


FIGURE ANNEX I. 17 E. GFCF
CURRENT YEAR

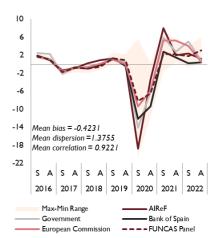


FIGURE ANNEX I. 17 B. PRIVATE CONSUMPTION FOLLOWING YEAR

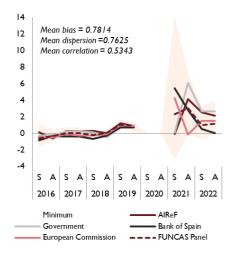


FIGURE ANNEX I. 17 D. PUBLIC CONSUMPTION FOLLOWING YEAR

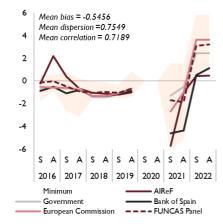


FIGURE ANNEX I. 17 F. GFCF FOLLOWING YEAR



Bank of Spain

--- FLINCAS Panel



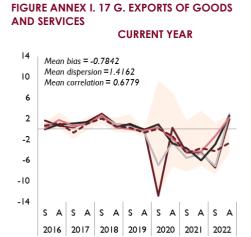


FIGURE ANNEX I. 17 H. EXPORTS OF GOODS AND SERVICES

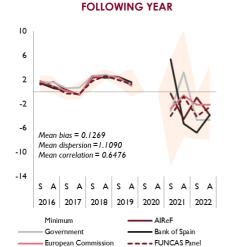
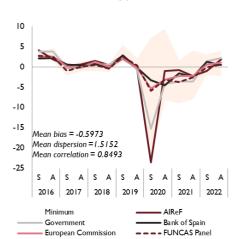
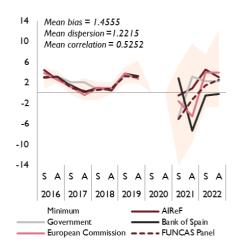


FIGURE ANNEX I. 17 I. IMPORTS OF GOODS AND SERVICES CURRENT YEAR

European Commission

FIGURE ANNEX I. 17 J. IMPORTS OF GOODS AND SERVICES
FOLLOWING YEAR





Source: INE, Ministry of Economic Affairs and Digital Transformation, Bank of Spain, FUNCAS and AIReF.

In terms of accuracy, there are no significant differences in the forecasting capacity of the different agencies. For the current year, the lowest accuracy of AIReF's estimates comes from the variables relating to the foreign sector and gross fixed capital formation, whereas, for the following year, only AIReF's forecasts for gross fixed capital formation show a lower degree of accuracy. However, in neither case are these differences sufficiently large to accept the hypothesis of equal predictive power.



FIGURE ANNEX I. 18. COMPARISON OF THE MEAN SQUARED ERROR IN THE ESTIMATES OF THE DEMAND AGGREGATES IN VOLUME TERMS

FIGURE ANNEX I. 18 A. PRIVATE CONSUMPTION CURRENT YEAR

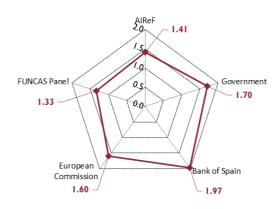


FIGURE ANNEX I. 18 B. PRIVATE CONSUMPTION FOLLOWING YEAR

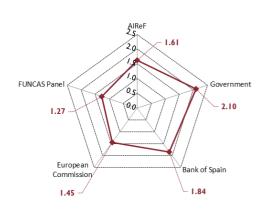
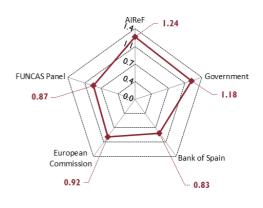


FIGURE ANNEX I. 18 C. PUBLIC CONSUMPTION CURRENT YEAR

FIGURE ANNEX I. 18 D. PUBLIC CONSUMPTION FOLLOWING YEAR



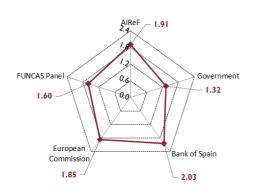
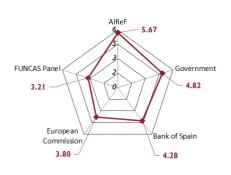
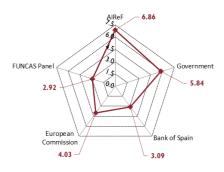


FIGURE ANNEX I. 18 E. GFCF - CURRENT YEAR

FIGURE ANNEX I. 18 F. GFCF -FOLLOWING YEAR





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FIGURE ANNEX I. 18 G. EXPORTS OF GOODS AND SERVICES - CURRENT YEAR

FIGURE ANNEX I. 18 H. EXPORTS OF GOODS AND SERVICES - FOLLOWING YEAR



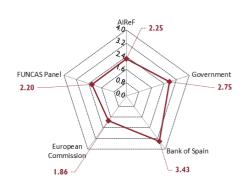
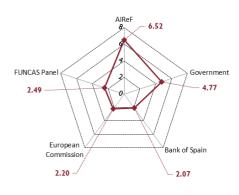
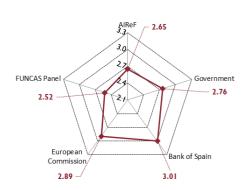


FIGURE ANNEX I. 18 I. IMPORTS OF GOODS AND SERVICES - CURRENT YEAR

FIGURE ANNEX I. 17 J. IMPORTS OF GOODS

AND SERVICES - NEXT YEAR





Source: INE, Ministry of Economic Affairs and Digital Transformation, Bank of Spain, FUNCAS and AIReF

The forecasts of the various agencies for the demand aggregates point in the right direction and are more efficient than a naive estimate. A certain degree of persistence (past errors tend to be associated with future errors) can be detected in the forecast errors for exports in the current year for all the agencies except the Government and AIReF. In the estimates for the following year, this tendency towards persistence is accentuated in the forecast errors for public and private consumption in some agencies and for gross fixed capital formation, for which persistence is detected in most agencies.

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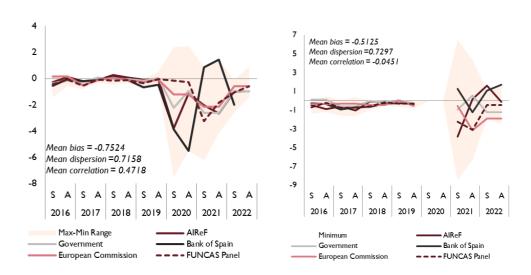
Comparison of forecast errors of full-time equivalent employment

The prediction errors made in estimating the evolution of full-time equivalent employment differ across agencies, with moderate correlations between them in the estimates for the current year and zero for the following year. For the current year, the different evolution forecast for 2020, strongly conditioned by pandemic constraints, causes the correlation to decrease, while for the following year the strong differences in both the shape and level of the estimated paths reduce it to zero. There is a common tendency for all agencies to underestimate the evolution of expenditure in the current year's estimates, without rejecting the hypothesis of equality between agencies' biases. For the following year, significant downward biases are still apparent in some agencies, such as the European Commission and the Funcas Panel, although in no case is the hypothesis of equality between the different agencies rejected.

FIGURE ANNEX I. 19. COMPARISON OF FORECAST ERRORS IN ESTIMATES OF FULL-TIME EQUIVALENT EMPLOYMENT IN THE CURRENT YEAR AND THE FOLLOWING YEAR

FIGURE ANNEX I. 19 A. CURRENT YEAR

FIGURE ANNEX I. 19 B. FOLLOWING YEAR



Source: INE, Ministry of Economic Affairs and Digital Transformation, Bank of Spain, FUNCAS and AIReF.

AlReF's employment estimates show a mean squared error like that of other agencies. The differences in predictive power are not statistically significant. The mean Theil's U statistic of the employment estimates made by the different agencies is similar and less than unity, and all the agencies can forecast the direction in the rate of change of employment in the current year. However, there are differences in the persistence over time of past errors, so that in the estimates for the current year, it is not rejected that

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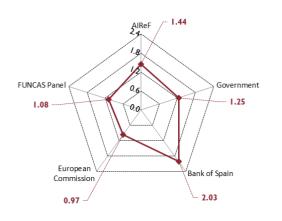


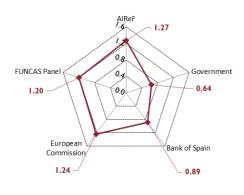
positive deviations increase the likelihood of continuing to overestimate expenditure in the European Commission's forecasts at the 5% significance level.

FIGURE ANNEX I. 20. COMPARISON OF THE MEAN SQUARED ERROR OF ESTIMATES OF FULL-TIME EQUIVALENT EMPLOYMENT

FIGURE ANNEX I. 20 A. CURRENT YEAR

FIGURE ANNEX I. 20 B. FOLLOWING YEAR





Source: INE, Ministry of Economic Affairs and Digital Transformation, Bank of Spain, FUNCAS and AIReF.

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ANNEX II. QUALITY MEASURES AND TESTS

							Current	/ear											Followir	ng yea	ır		
		N	Bias [p-value]	MAE	RMSE	MD¹ [p-value]	MD²	UT	DA [p-value]	PE [p-value]]ρ[Q p-value] T [p-value]	Ν	Bias [p-value	MAE	RMSE	MD1 [p-valu	e] [MD²	UT	DA [p-value] PE [p-value]	ρ [Q p-value] T [p-valu	ıe]
Gross Domestic Product	AIReF	14	0.03 [0.85]	0.45	0.63			0.12	3.88 [0.00]	3.64 [0.00]	0.	17 [0.54]	14	0.41 [0.19]	0.7	1.07				0.28		0.38 [0.15]	
	Government	14	0.08 [0.72]	0.63	0.84	-1.49 [0.16]	Do Not Reject	0.16	3.88 [0.00]	3.64 [0.00]	0.0	08 [0.77] -0.44 [0.66]	14	0.65 [0.17]	1.05	1.60	-1.38 [0.20]] Do N	ot Reject	0.42		0.54 [0.04] -1.15 [0.2	27]
	Bank of Spain	14	0.02 [0.92]	0.52	0.68	-0.40 [0.70]	Do Not Reject	0.13	3.88 [0.00]	3.64 [0.00]	-0.	.09 [0.73] 0.13 [0.90]	14	0.14 [0.67]	0.67	1.05	0.03 [0.97]] Do N	ot Reject	0.28		0.29 [0.32] 0.72 [0.4	9]
G.	European Commissio	14	-0.11 [0.65]	0.61	0.82	-1.14 [0.27]	Do Not Reject	0.15	3.88 [0.00]	3.64 [0.00]	-0.	28 [0.30] 1.06 [0.31]	14	0.23 [0.38]	0.69	0.86	0.47 [0.65]] Do N	ot Reject	0.23		0.46 [0.08] 0.62 [0.5	5]
	FUNCAS Panel	14	-0.06 [0.79]	0.64	0.80	-1.20 [0.25]	Do Not Reject	0.15	3.88 [0.00]	3.64 [0.00]	-0.	.09 [0.74] 0.75 [0.47]	14	0.17 [0.51]	0.65	0.83	1.03 [0.33]] Do N	ot Reject	0.22		0.53 [0.06] 1.54 [0.1	5]
e Consumption		Ν	Bias [p-value]	MAE	RMSE	MD ¹ [p-value]	MD ²	UT	DA [p-value]	PE [p-value]]ρ[Q p-value] T [p-value]	N	Bias [p-value] MAE	RMSE	MD ¹ [p-valu	e] [MD²	UT	DA [p-value] PE [p-value]	ρ [Q p-value] T [p-valu	ıe]
	AIReF	14	0.33 [0.41]	0.98	1.41			0.26	3.88 [0.00]	3.65 [0.00]	-0.	.02 [0.93]	14	0.93 [0.04]	1.06	1.61				0.50		0.34 [0.20]	
	Government	14	0.47 [0.31]	1.06	1.70	-1.09 [0.29]	Do Not Reject	0.31	3.88 [0.00]	3.65 [0.00]	0.0	03 [0.91] -0.77 [0.45]	14	1.06 [0.08]	1.23	2.10	-1.11 [0.29]] Do N	ot Reject	0.65		0.30 [0.27] -0.74 [0.4	4 7]
	Bank of Spain	14	0.67 [0.21]	1.14	1.97	-1.32 [0.21]	Do Not Reject	0.36	3.88 [0.00]	3.65 [0.00]	0.3	26 [0.33] -1.53 [0.15]	14	0.61 [0.27]	1.09	1.84	-0.28 [0.78]] Do N	ot Reject	0.57		0.46 [0.09] 0.55 [0.5	9]
Private	European Commissio	14	-0.13 [0.78]	1.15	1.60	-0.54 [0.60]	Do Not Reject	0.29	3.88 [0.00]	3.65 [0.00]	0.0	03 [0.91] 1.70 [0.11]	14	0.61 [0.15]	0.92	1.45	0.22 [0.83]] Do N	ot Reject	0.45		0.11 [0.81] 0.58 [0.5	7]
~	FUNCAS Panel	14	0.22 [0.55]	0.97	1.33	0.44 [0.67]	Do Not Reject	0.24	3.88 [0.00]	3.65 [0.00]	-0.	.01 [0.98] 0.65 [0.53]	14	0.70 [0.05]	0.89	1.27	1.02 [0.33]] Do N	ot Reject	0.40		0.63 [0.02] 0.78 [0.4	.5]
		Ν	Bias [p-value]	MAE	RMSE	MD¹ [p-value]	MD ²	UT	DA [p-value]	PE [p-value]] p [Q p-value] T [p-value]	Ν	Bias [p-value] MAE	RMSE	MD¹ [p-valu	e] [MD²	UT	DA [p-value] PE [p-value]	ρ [Q p-value] Τ [p-valu	ıe]
Consumption	AIReF	14	0.27 [0.44]	0.92	1.24			0.53	2.64 [0.00]	1.98 [0.02]	0.3	20 [0.45]	14	-0.69 [0.23]	1.28	1.91				0.97	2.80 [0.00] 1.69 [0.05]	0.23 [0.46]	
nsur	Government	14	-0.02 [0.96]	0.85	1.18	0.28 [0.79]	Do Not Reject	0.51	2.64 [0.00]	1.98 [0.02]	-0.	21 [0.43] 0.94 [0.36]	14	-0.33 [0.41]	1.14	1.32	0.70 [0.50]] Do N	ot Reject	0.67		0.54 [0.05] -0.70 [0.5	50]
ပို	Bank of Spain	14	-0.22 [0.34]	0.71	0.83	1.31 [0.21]	Do Not Reject	0.36	3.88 [0.00]	2.91 [0.00]	-0.	.09 [0.73] 2.57 [0.02]	14	-1.25 [0.02]	1.53	2.03	-0.24 [0.81] Do N	ot Reject	1.03	0.57 [0.28] -0.01 [0.50]	0.27 [0.24] 1.48 [0.1	7]
Public	European Commissio	14	0.20 [0.43]	0.71	0.92	1.63 [0.13]	Reject at 10%	0.40	3.88 [0.00]	2.91 [0.00]	0.	52 [0.05] 0.29 [0.78]	14	-0.26 [0.65]	1.47	1.85	0.09 [0.93]] Do N	ot Reject	0.94		0.45 [0.10] -0.82 [0.4	43]
-	FUNCAS Panel	14	0.25 [0.31]	0.69	0.87	1.36 [0.20]	Do Not Reject	0.37			0.:	3 [0.25] 0.09 [0.93]	14	-0.20 [0.69]	1.25	1.60	0.38 [0.71]] Do N	ot Reject	18.0		0.38 [0.18] -0.97 [0.3	35]
<u> </u>		Ν	Bias [p-value]	MAE	RMSE	MD¹ [p-value]	MD ²	UT	DA [p-value]	PE [p-value]] p [Q p-value] T [p-value]	Ν	Bias [p-value] MAE	RMSE	MD¹ [p-valu	e] [MD²	UT	DA [p-value] PE [p-value]	ρ [Q p-value] Τ [p-valu	ıe]
Capital	AIReF	14	-0.43 [0.79]	3.09	5.67			0.98	3.88 [0.00]	3.69 [0.00]	0.	14 [0.61]	14	3.92 [0.04]	4.74	6.86				1.63		0.68 [0.01]	
ed C	Government	14	-0.19 [0.89]	3.22	4.82	0.76 [0.46]	Do Not Reject	0.83	3.88 [0.00]	3.69 [0.00]	0.3	25 [0.35] -0.48 [0.64]	14	3.43 [0.03]	4.38	5.84	0.81 [0.44]] Do N	ot Reject	1.38		0.69 [0.01] 0.73 [0.4	8]
Gross Fixed Format	Bank of Spain	14	-1.18 [0.32]	2.45	4.28	0.85 [0.41]	Do Not Reject	0.74	3.88 [0.00]	3.69 [0.00]	0.:	32 [0.24] 0.99 [0.34]	14	1.99 [0.02]	2.34	3.09	1.56 [0.15]] Do N	ot Reject	0.73		0.31 [0.22] 1.24 [0.2	4]
iros	European Commissio	14	0.03 [0.98]	2.66	3.80	0.91 [0.38]	Do Not Reject	0.65	3.88 [0.00]	3.69 [0.00]	0.:	38 [0.16] -0.57 [0.58]	14	2.08 [0.07]	2.85	4.03	1.28 [0.23]] Do N	ot Reject	0.96		0.31 [0.21] 1.23 [0.2	.5]
O	FUNCAS Panel	14	-0.34 [0.70]	2.36	3.21	1.04 [0.32]	Do Not Reject	0.55	3.88 [0.00]	3.69 [0.00]	0.:	32 [0.23] -0.09 [0.93]	14	1.64 [0.05]	2.47	2.92	1.77 [0.10]] Do N	ot Reject	0.69		0.72 [0.01] 2.04 [0.0	7]
		Ν	Bias [p-value]	MAE	RMSE	MD¹ [p-value]	MD ²	UT	DA [p-value]	PE [p-value]] p [Q p-value] T [p-value]	Ν	Bias [p-value] MAE	RMSE	MD¹ [p-valu	e] [MD²	UT	DA [p-value] PE [p-value]	ρ [Q p-value] Τ [p-valu	ıe]
	AIReF	14	-1.31 [0.29]	2.87	4.46			0.39	3.88 [0.00]	3.31 [0.00]	0.0	06 [0.83]	14	0.15 [0.83]	1.82	2.25				0.25		0.41 [0.12]	
Exports	Government	14	-1.21 [0.21]	2.7	3.57	0.85 [0.41]	Do Not Reject	0.31	3.88 [0.00]	3.31 [0.00]	0.:	35 [0.19] -0.19 [0.85]	14	0.35 [0.68]	2.42	2.75	-1.18 [0.26]] Do N	ot Reject	0.30		0.14 [0.53] -0.25 [0.8	81]
꿃	Bank of Spain	14	-0.33 [0.63]	1.88	2.47	1.14 [0.27]	Do Not Reject	0.22	3.88 [0.00]	3.31 [0.00]	0.	53 [0.05] -0.91 [0.38]	14	0.02 [0.99]	2.75	3.43	-1.57 [0.15]] Do N	ot Reject	0.38		0.40 [0.19] 0.19 [0.8	6]
	European Commissio	14	-0.21 [0.71]	1.53	2.07	1.30 [0.22]	Do Not Reject	0.18	3.88 [0.00]	3.31 [0.00]	0.	56 [0.04] -1.03 [0.32]	14	0.27 [0.64]	1.63	1.86	0.78 [0.45]] Do N	ot Reject	0.20		0.46 [0.05] -0.26 [0.8	30]
	FUNCAS Panel	14	-0.85 [0.16]	1.7	2.24	1.26 [0.23]	Do Not Reject	0.20	3.88 [0.00]	3.31 [0.00]	0.	72 [0.01] -0.43 [0.67]	14	-0.15 [0.82]	1.83	2.20	0.10 [0.92]] Do N	ot Reject	0.24		0.42 [0.05] 0.55 [0.5	9]
		Ν	Bias [p-value]	MAE	RMSE	MD ¹ [p-value]	MD^2	UT	DA [p-value]	PE [p-value]]ρ[Q p-value] T [p-value]	Ν	Bias [p-value	MAE	RMSE	MD ¹ [p-valu	e] [MD²	UT	DA [p-value] PE [p-value]	ρ [Q p-value] T [p-valu	ıe]
Imports	AIReF	14	-1.12 [0.54]	3.03	6.52			0.74	3.88 [0.00]	3.31 [0.00]	0.0	04 [0.88]	14	2.07 [0.00]	2.16	2.65				0.38		0.16 [0.38]	
	Government	14	-0.95 [0.48]	3.04	4.77	0.85 [0.41]	Do Not Reject	0.54	3.88 [0.00]	3.31 [0.00]	0.:	3 [0.25] -0.23 [0.82]	14	1.76 [0.02]	2.53	2.76	-0.22 [0.83]] Do N	ot Reject	0.39		-0.24 [0.75] 0.62 [0.5	5]
	Bank of Spain	14	-0.14 [0.81]	1.63	2.07	0.98 [0.34]	Do Not Reject	0.23	3.88 [0.00]	3.31 [0.00]	0.4	46 [0.09] -0.64 [0.53]	14	0.92 [0.31]	2.26	3.01	-0.40 [0.70]] Do N	ot Reject	0.43		0.13 [0.74] 1.30 [0.2	:2]
	European Commissio	14	-0.24 [0.70]	1.68	2.20	1.00 [0.33]	Do Not Reject	0.25	3.88 [0.00]	3.31 [0.00]	0.	50 [0.06] -0.65 [0.53]	14	1.45 [0.08]	2.52	2.89	-0.72 [0.49]] Do N	ot Reject	0.41		0.14 [0.46] 1.35 [0.2	:0]
	FUNCAS Panel	14	-0.54 [0.44]	1.86	2.49	0.98 [0.35]	Do Not Reject	0.28	3.88 [0.00]	3.31 [0.00]	0.4	43 [0.11] -0.43 [0.68]	14	1.08 [0.15]	2.13	2.52	0.22 [0.83]] Do N	ot Reject	0.36		0.16 [0.18] 2.21 [0.0	/5]
		N	Bias [p-value]	MAE	RMSE	MD¹ [p-value]	MD²	UT	DA [p-value]	PE [p-value]]ρ[Q p-value] T [p-value]	Ν	Bias [p-value	MAE	RMSE	MD1 [p-valu	e] [MD²	UT	DA [p-value] PE [p-value]	ρ [Q p-value] T [p-valu	ıe]
Employment	AIReF	14	-0.84 [0.02]	0.91	1.44			0.32	3.88 [0.00]	3.52 [0.00]	0.:	3 [0.25]	14	-0.46 [0.22]	0.76	1.27				0.34		-0.01 [0.97]	
	Government	14	-0.80 [0.01]	0.82	1.25	0.72 [0.49]	Do Not Reject	0.28	3.88 [0.00]	3.52 [0.00]	0.4	49 [0.07] -0.34 [0.74]	14	-0.34 [0.06]	0.49	0.64	1.07 [0.31]] Do N	ot Reject	0.17		-0.10 [0.73] -0.32 [0.7	76]
	Bank of Spain	14	-0.85 [0.13]	1.24	2.03	-0.83 [0.42]	Do Not Reject		3.75 [0.00]	3.39 [0.00]	0.3	21 [0.45] 0.03 [0.97]	14	-0.08 [0.77]	0.76	0.89	0.74 [0.48]] Do N	ot Reject	t		0.02 [0.82] -0.80 [0.4	44]
	European Commissio	14	-0.62 [0.01]	0.67	0.97	1.21 [0.25]	Do Not Reject	0.22	3.88 [0.00]	3.52 [0.00]	0.0	63 [0.02] -1.17 [0.26]	14	-0.85 [0.01]	0.85	1.24	0.06 [0.96]] Do N	ot Reject	0.33		0.48 [0.08] 0.74 [0.4	-8]
	FUNCAS Panel	14	-0.64 [0.02]	0.64	1.08	0.77 [0.45]	Do Not Reject	0.24	3.88 [0.00]	3.52 [0.00]	0.4	40 [0.13] -0.67 [0.51]	14	-0.83 [0.01]	0.83	1.20	0.16 [0.87]] Do N	ot Reject	0.31		0.31 [0.14] 1.03 [0.3	2]



ANNEX III. INDICATORS OF VOLATILITY OF DEMAND-SIDE AGGREGATES

STANDARD DEVIATION OF THE QUARTER-ON-QUARTER RATE OF CHANGE IN VOLUME TERMS OVER THE FIRST SEVEN ON A ESTIMATES FOR EACH QUARTER

FIGURE ANNEX III. 1. HOUSEHOLD FINAL CONSUMPTION **EXPENDITURE**

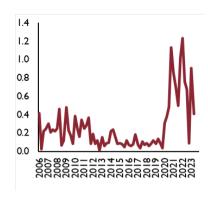
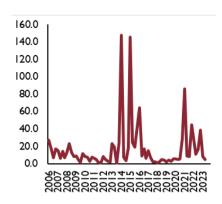


FIGURE ANNEX III. 4. CHANGES IN INVENTORIES AND **ACQUISITIONS LESS DISPOSALS OF VALUABLES**



Source: INE

FIGURE ANNEX III. 2. GG FINAL CONSUMPTION **EXPENDITURE**

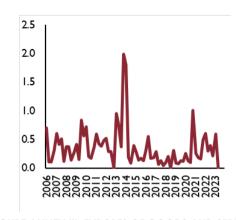


FIGURE ANNEX III. EXPORTS OF GOODS AND SERVICES

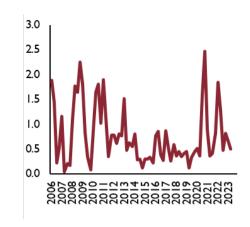


FIGURE ANNEX III. GROSS FIXED CAPITAL FORMATION

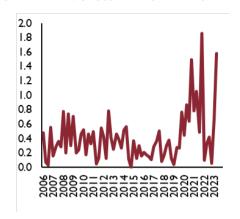
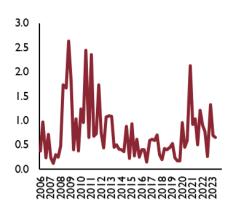


FIGURE ANNEX III. 6. IMPORTS OF GOODS AND SERVICES





ANNEX IV. FISCAL FORECASTS FOR 2021-2022 AND THEIR ERRORS

For greater detail of the methodology used and forecast errors from previous years, see <u>Technical Paper 2/2022</u>.

Revisions 2021

AlReF's reports for this year were issued without alterations to its traditional publication schedule. The first two revisions in which it expressed a view on the fiscal outturn for 2021 took place in 2020, while the next four revisions took place in 2021. It should only be noted that the Report on the Stability Programme Update (SPU) issued by AlReF in May 2020 was merged with the Report on the Initial Budgets (Revision 1) and that, due to the exceptional circumstances of the pandemic, it shortened its forecast period to the current and following years, while the SPU issued by the Government only assessed fiscal forecasts for the current year.

TABLE ANNEX IV. 1. REVISIONS TO THE AIREF FORECAST 2021

		2021						
Revision No.	Statute Art.	Published report	Publication date	Days until flash estimate known				
1	Art.15	20-21 SPU /Initial Bud. 20	5/6/2020	701				
2	Art.17	Draft Budget 2021	11/5/2020	518				
3	Art.18	Initial Bud. 2021	4/8/2021	364				
4	Art.15	2021-2024 SPU	5/11/2021	331				
5	Art.19	Budgetary execution 2021	7/15/2021	266				
6	Art.17	Draft Budget 2022	10/25/2021	164				
Flash estima	ate ⁽¹⁾	Initial Bud. 2022	4/7/2022	-				

⁽I) First publication of the IGAE on the closing of the accounting year

Source: Prepared by AIReF



Revisions 2022

AIReF's reports for this year were issued without alterations to its traditional publication schedule, so that the first two forecasts for 2022 took place in 2021 and the remaining four in 2022.

TABLE ANNEX IV. 2. REVISIONS TO THE AIREF 2022 FORECAST

		2022								
Revision No.	Statute Art.	Published report	Publication date	Days until NA flash estimate is known						
1	Art.15	2021-2024 SPU	5/11/2021	694						
2	Art.17	Draft Budget 2022	10/25/2021	527						
3	Art.18	Initial Bud. 2022	4/7/2022	363						
4	Art.15	2022-2025 SPU	5/12/2022	328						
5	Art.19	Budgetary execution 2022	7/15/2022	264						
6	Art.17	Draft Budget 2023	10/25/2022	162						
Flash estima	ate ⁽¹⁾	Initial Bud. 2023	4/5/2023	-						

⁽I) First publication of the IGAE on the closing of the accounting year.

Source: Prepared by AIReF



FIGURE ANNEX IV. 1. EVOLUTION OF THE FORECASTS COMPARED WITH THE FLASH ESTIMATE: €M

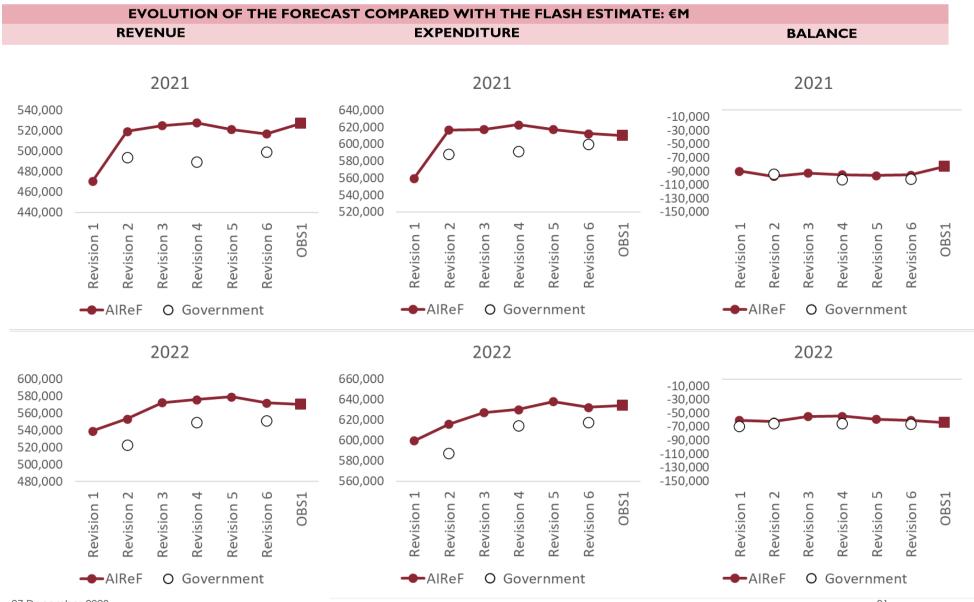




FIGURE ANNEX IV. 2. EVOLUTION OF THE FORECASTS COMPARED WITH THE FLASH ESTIMATE: %GDP

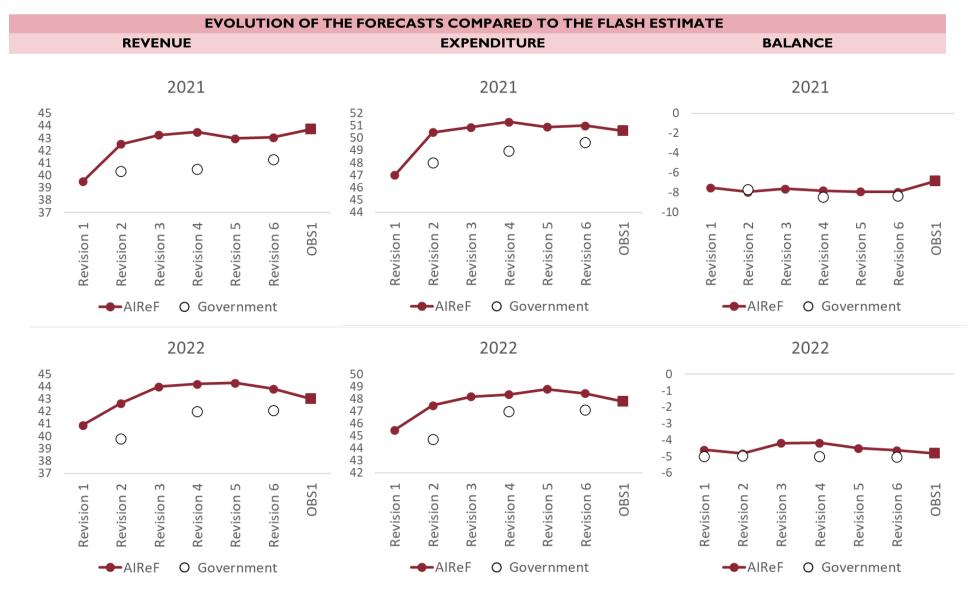






FIGURE ANNEX IV. 3. FORECASTS AND FORECAST ERRORS: REVENUE

FORECASTS AND FORECAST ERRORS REVENUE

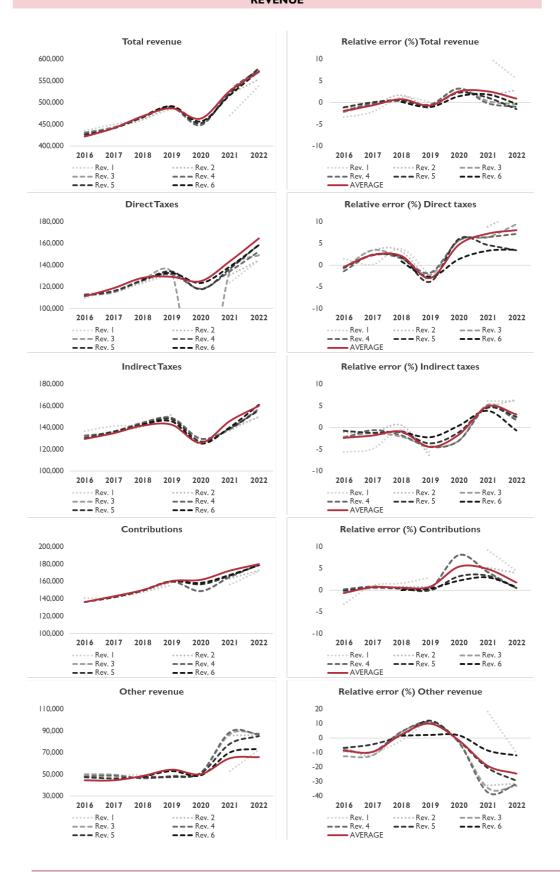
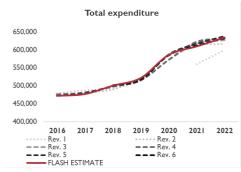
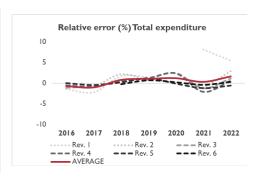


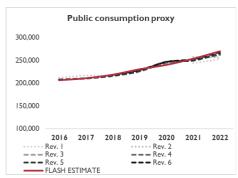


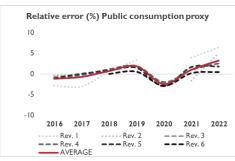
FIGURE ANNEX IV. 4. FORECASTS AND FORECAST ERRORS: EXPENDITURE

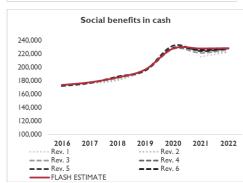
FORECASTS AND FORECAST ERRORS EXPENDITURE

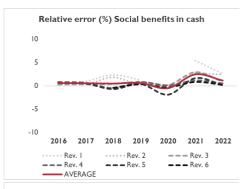


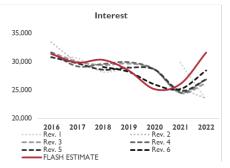


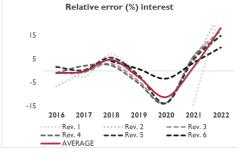


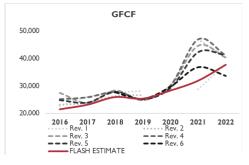


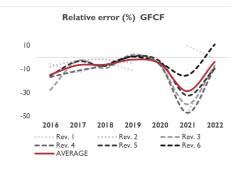














FORECASTS AND FORECAST ERRORS EXPENDITURE

