

## Box 3: Shock Decomposition of 2021 Forecast Errors

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After facing the worst recession in its history brought about by the COVID-19 pandemic in 2020, coupled with a sharp drop in inflation, the Colombian economy in 2021 experienced a rapid recovery in its gross domestic product (GDP) and a significant inflation acceleration. The fluctuations of these variables in 2021 were unexpected and surpassed the market average estimates and those constructed by the technical staff of *Banco de la República*, provoking considerable forecast errors. Of course, not all these surprises occurred in one single quarter, hence *Banco de la República's* technical staff identified the various sources of these unexpected developments in the Monetary Policy Reports (MPR) of 2021 and consistently readjusted its forecasts during the year.

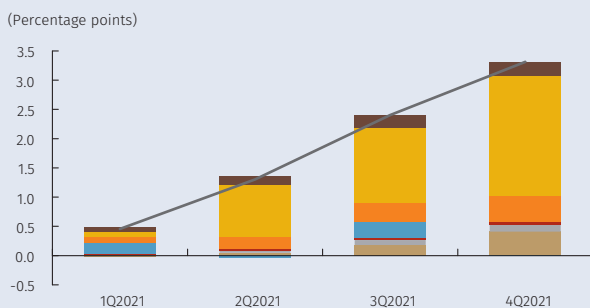
In this Box, we employ a strategy comparable to that described in De Castro-Valderrama *et al.* (2021)<sup>1</sup> and use the 4G model to identify the type of macroeconomic shocks that explain the forecast errors and to what degree. In other words, the model compares the data observed in 2021 to the forecasts published in the January 2021 MPR in terms of shocks.<sup>2</sup> This report in particular is used as a point of reference since it included the technical staff's initial economic outlook for 2021, prepared under the assumption that new surprises would not occur beyond those already included in said forecasts. This technique is applied to GDP growth (year-over-year and twelve-month)<sup>3</sup> and annual inflation (headline and core inflation). This exercise is part of a continual internal review process conducted by the technical staff on its forecasts.

### 1. Errors in headline and core inflation

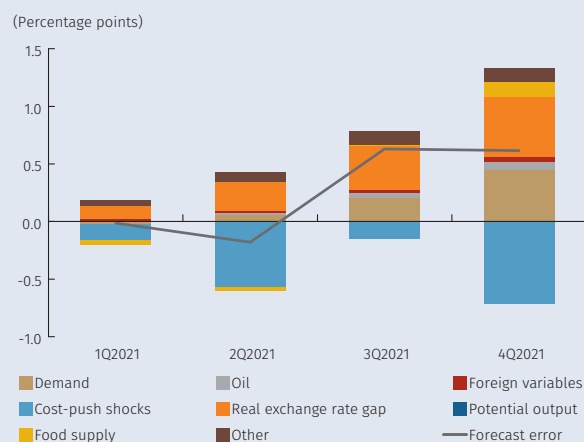
Graph B3.1 shows the decomposition of the forecast error of the 4G model, defined as the observed data minus the forecast. The decomposition illustrates higher forecast errors in headline inflation than in core inflation, primarily associated with the impact of the food basket shocks. This is consistent with the surprises generated by the national strike in the second quarter of 2021, the low production cycles for certain agricultural items, and the high transportation

Graph R3.1

#### A. Headline Inflation (YoY)



#### B. Core Inflation (YoY)



Source: DANE and Banco de la República. Author's calculations

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- 1 This paper details a way to use a semi-structural general equilibrium model and the Kalman Smoother to build a multivariate filter to interpret the shocks behind forecasts and observed data to compare the economic stories that explain them.
- 2 The result of this procedure is a shock matrix that would allow reconstructing the observed data. Subsequently, the original matrix used to construct the MPR forecast for January 2021 is subtracted from this resulting matrix, thereby obtaining the shocks that explain the forecast errors.
- 3 Year-over-year GDP growth refers to the annual change in quarterly GDP, while twelve-month growth indicates the annual change in GDP (four-quarter cumulative).

costs experienced throughout the year. In addition, food prices were affected by the unexpected increases in the prices of some of these goods abroad, which were especially high in the second half of the year.

Foreign exchange rate pressures, measured by the real exchange rate gap, together with additional forces stemming from aggregate demand, also affected headline inflation. These two inflationary pressures were more intense on core inflation, although they were offset by more favorable supply shocks than initially contemplated by the technical staff. The latter shocks would capture the extension into the second quarter of 2021 of certain tax reliefs associated with the health emergency that the technical staff expected would be reversed during that period. Likewise, these shocks include the three VAT-free days decreed in the last quarter of the year, which had not been anticipated initially.

These decompositions made using the 4G model confirm that, for the most part, the inflation forecasting errors were the result of unexpected shocks that were difficult to foresee at the beginning of 2021, both as to their origin as well as their magnitude.

## 2. Errors in GDP growth

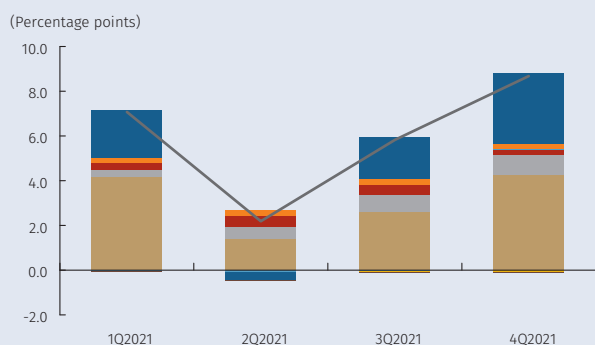
Regarding economic growth in 2021, Graph B3.2 shows that forecast errors were largely explained by the behavior of aggregate demand and, to a lesser extent, of potential GDP. After the initial COVID-19 crisis, the technical staff expected in its central macroeconomic scenario a moderate demand rebound,<sup>4</sup> given the social distancing measures decreed in January 2021 because of the pandemic, tax uncertainty, and the weakness of the labor market. However, the economy experienced a much more vigorous recovery throughout the year than originally expected.

The first surprise regarding economic growth occurred in the first quarter of the year and was mainly related to an overestimation of the effects the resurgence of the pandemic will have on private consumption. This is illustrated in Graph B3.2, wherein it can be seen that the shock that contributed most to the quarterly GDP error was the demand shock. The behavior of potential output also played a part in the forecast error since, based on the technical staff's criteria, the pandemic is considered to also entail contractions of the economy's productive capacity. In the third and fourth quarters of 2021, the year-over-year GDP growth was also higher than expected due to a new upsurge in demand, better oil prices and lenient external financial conditions. Nevertheless, much of this underestimation in the second half of the year is associated with the initial surprise of the first quarter of 2021, which explains why the demand shock exerted a cumulative upward pressure on twelve-month GDP growth.

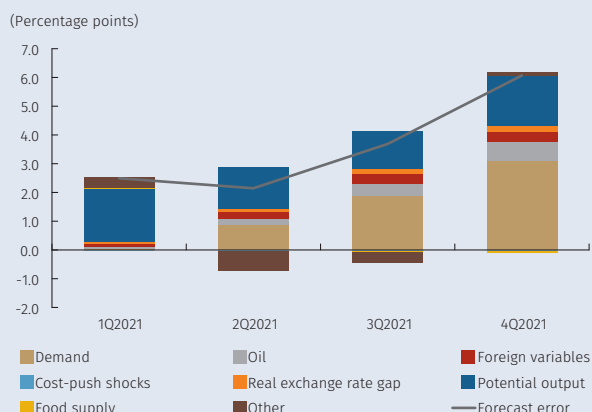
The correction of the forecast error in the second quarter of 2021 is also quite apparent in Graph B3.2, both in year-over-year and twelve-month GDP growth. This correction occurs as a consequence of the national strike and the new infection wave of the pandemic. Although these shocks were not expected by the Central Bank's technical staff in January, they brought the data closer to the forecast value, which further confirms the unusual behavior of consumption during the first quarter of 2021. It is worth noting that because the strike

Graph R3.2

### A. YoY GDP growth



### B. Twelve-month GDP growth



Source: DANE and Banco de la República. Author's calculations

<sup>4</sup> The recovery was expected to be underpinned by better terms of trade, ample external financing, higher household and business confidence, and low interest rates.

was a temporary negative supply shock, it affected the potential output estimate more as opposed to that of demand in the second quarter of 2021.

Finally, the shock decompositions of Graph B3.2 reveal that those that actually materialized in the data and were not foreseen in January 2021 coincided with the number of surprises identified in the economic activity series and which were gradually recognized in the various Monetary Policy Reports published along the year. Accordingly, this corroborates that *Banco de la República's* technical staff underestimated the behavior of both potential output and aggregate demand, but that the sources of their forecast errors were unforeseeable shocks that significantly stimulated growth, even in an environment of rising inflation, high public indebtedness levels, and widespread global and national uncertainty.

### References

- De Castro-Valderramay, Marcela, Santiago Forero-Alvarado, Nicolás Moreno-Arias, Sara Naranjo-Saldarriaga. 2021. "Unraveling the Exogenous Forces Behind Analysts' Macroeconomics Forecasts", *Borradores de Economía*, No. 1184. *Banco de la República*.
- González, Andrés, Alexander Guarín, Diego A. Rodríguez-Guzmán. 2021. "4GM: A New Model for the Monetary Policy Analysis in Colombia", *Borradores de Economía*, No. 1106. *Banco de la República*. <https://doi.org/10.32468/be.1106>.