SPECIAL REPORT

A Model to Forecast Probability of Recession in Brazil

Lucas Maynard*
economiabrasill@santander.com.br
+5511 3553 7495

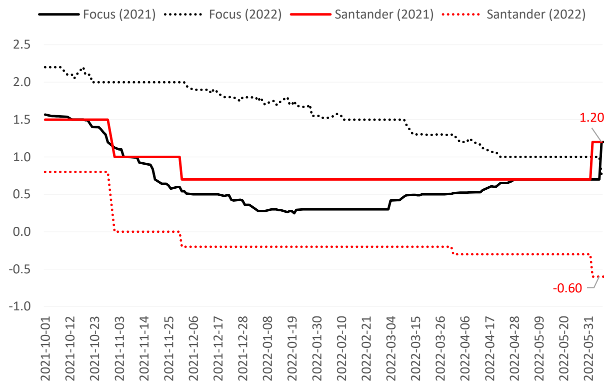
- Activity releases in the first quarter surprised to the upside on a widespread basis, topping our already optimistic expectations and reinforcing the likelihood of our resilient 2022 GDP outlook amid some forecasts of null growth and an economic retreat as early as this year.
- Despite recent upwardly revised GDP forecasts, we must bear in mind that the fundamentals for a drag on economic activity have not vanished. Indeed, the lag with which monetary policy stances operate, along with the positive commodity price cycles help to explain domestic activity's resilience in 2022, postponing the probability of recession to the end of this year and onward.
- In the absence of any additional drivers and assuming the assumptions presented in this report, domestic activity will hardly avoid a gloomy recessionary outlook in the forthcoming year, as the delayed effects of a tight monetary policy stance materialize and the commodity price cycle cools down.
- In a hypothetical simulation of our baseline scenario for commodities, assuming positive shocks that sustain CRB index stability levels until YE2023, it would even be possible to mitigate the probability of recession this year. However, we would probably still not avoid a recessive scenario in 2023.

The final months of 2021 and the first months of 2022 were marked by widespread downward 2022 GDP growth revisions among professional forecasters, with Focus (the Brazil Central Bank's [BCB] forecast survey) market consensus sharply declining from +1.5% (on October 1, 2021) to 0.36% (December 30, 2021), and reaching the bottom, at 0.25% (on January 20, 2022). These revisions took place mainly after the assessment that monetary conditions had entered a restrictive stance, which in fact occurred as pointed out by our monetary condition proxies (surpassing the zero-neutral threshold in October and December[1]). The general outlook at the time considered tepid figures in 1H22, followed by a more prominent contraction of broad activity in 2H22, as the delayed effects of a restrictive monetary policy materializes. Considering this scenario of heterogeneity for the two semesters, we saw some forecasts pointing to null growth or even a contraction this year, although in our scenarios we have never consider the maintenance of this poor performance[2].

[1] Setting our proxies definitions: monetary stimulus considers the 1-year Swap rate, while our policy stance rate considers the SELIC rate. Both are used in real terms (deflated with ex-ante expectations) and with a neutral rate proxy calculated with an HP filtering in 5y5y inflation-linked bond rate series. Please, see Figure 2.

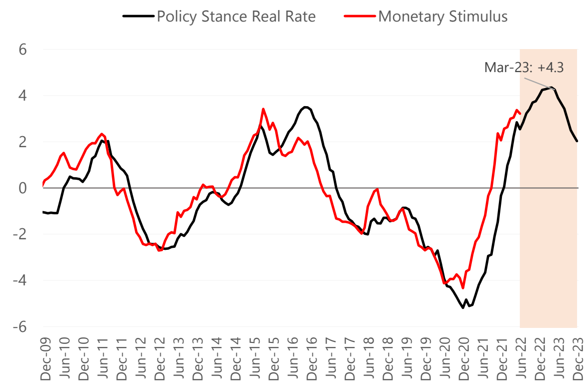
[2] **Santander Brazil Economic Activity - *"Special Report: Resilience Factors for 2022 GDP Growth"* –** January 14, 2022 - Available on: https://bit.ly/Std-special-011422

Figure 1 – GDP Forecasts Evolution (% Full-Year)



Sources: BCB, Santander.

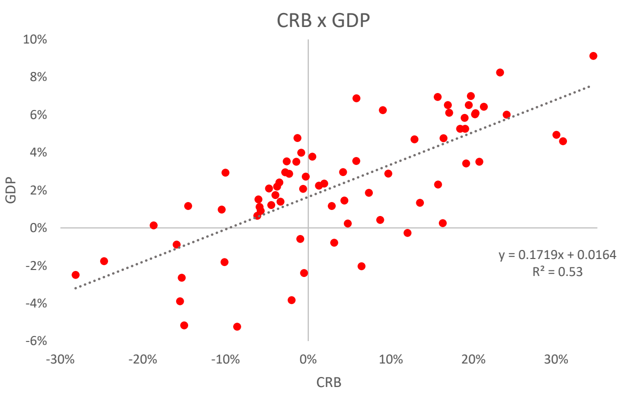
Figure 2 – Proxies for monetary conditions*



Sources: BCB, Santander. *Forecasts for June-22 onwards.

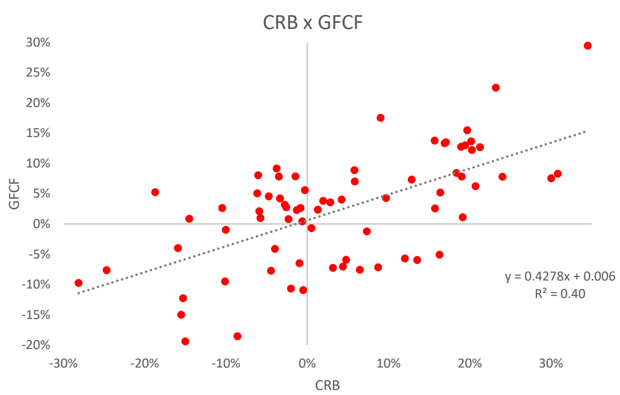
Among the key factors to support the Brazilian economy this year despite the delayed effects of a tight monetary policy, we highlight: (i) the consolidation of the economy's reopening process (mainly benefitting the services sector); (ii) the labor market recovery (with the recovery of the real wage bill as a byproduct); and (iii) the strengthening of commodity-related sectors. Regarding the latter, the positive historical correlation between rising commodity prices and Brazilian domestic activity has been well established, primarily through the channel of net exports but also through the investments made in commodity-related sectors. That said, given the CRB path assumption set at the time, the expectations of positive contributions for growth coming from commodity-related sectors were justified.

Figure 3 – GDP x CRB Index (YoY%)



Sources: IBGE, Santander.

Figure 4 – GFCF x CRB Index (YoY%)

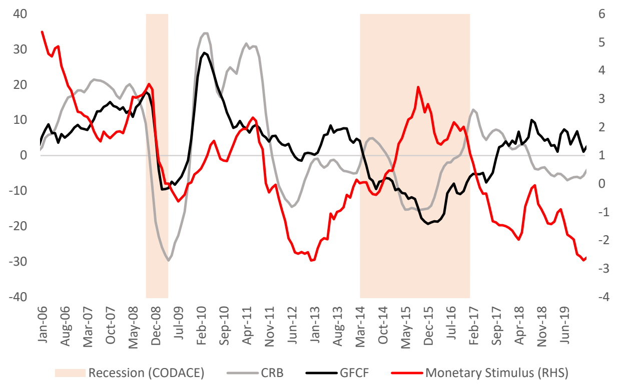


Sources: IBGE, Santander.

This report aims to assess the probability of recession for the Brazilian economy from 2Q21 onward, given our assumptions for two relevant vectors of domestic activity: monetary conditions and commodity prices. We make use of a Probit framework, where for the dependent variable we choose the series containing the economic cycle dating (value 1 for recession, 0 for the remaining periods) according to *CODACE/FGV*[3] (Economic Cycle Dating Committee). For the monetary conditions vector, we use our monetary stimulus proxy (six months lagged, to capture the delayed effects of shaky financial conditions and monetary tightening), while for commodity prices we consider YoY changes in the CRB index (in three-month moving average). We established our model considering the period of July 2006 to December 2019, using a total sample size of 162 monthly observations, and Figure 5 below presents the variables (along with gross fixed capital formation series). Our model presents significant coefficients with intuitive values (negative for CRB and positive for monetary stimulus), and Figure 6 below presents the in-sample fit.

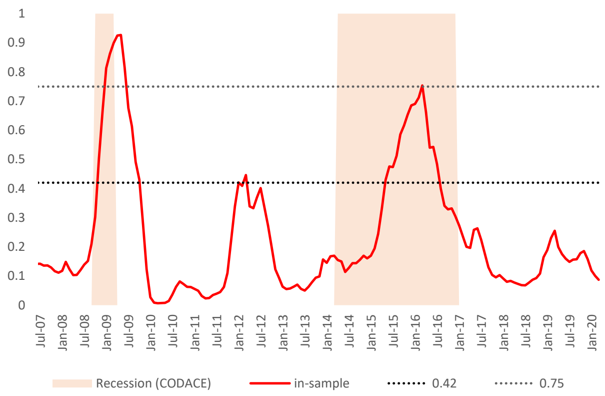
[3] The first recession dated period comprises 4Q08 to 1Q09, while the second one comprises 2Q14 to 4Q16.

Figure 5 – Variables (3mma-YoY% and points)



Sources: IPEA, Bloomberg, FGV, Santander.

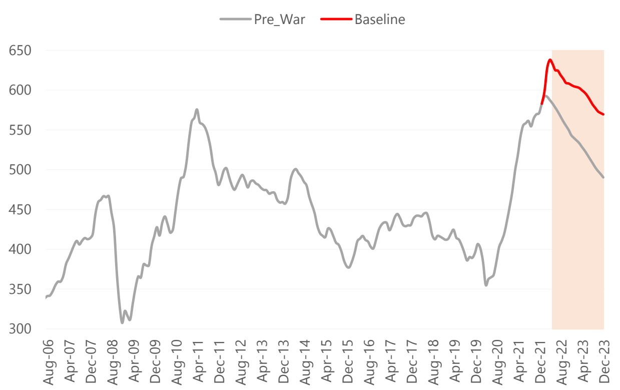
Figure 6 – In-Sample Fit of Probit Model



Sources: IPEA, IBGE, Santander.

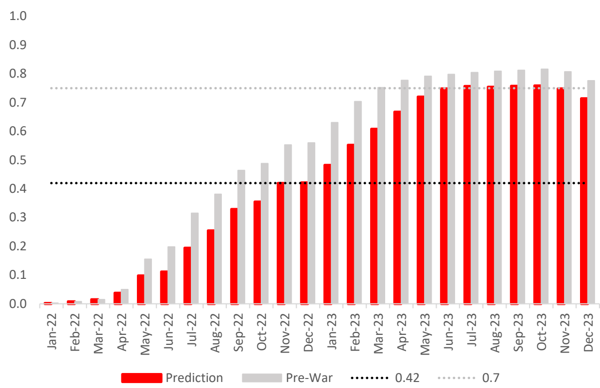
Figure 6 focuses attention on three periods in our sample. In the first marked period, we see a sharp increase in the probability of recession and a leap from 0.15 in August 2008 (before the recession period) to 0.50 in November 2008, and ending the recession period with a 0.90 spike in March 2009. In the second marked period, we see another sharp increase in the probability of recession with a leap from 0.17 in January 2015 to 0.43 in May 2015, reaching a 0.75 spike in March 2016 and starting a gradual decline. However, despite this relatively good adjustment in the original series, we also see a period when the probability of recession sharply increased in a period not dated with an effective recession. Indeed, the probability of recession rose from 0.11 in October 2011 to 0.42 in January 2012, suggesting a false positive assessment in our model and likely reflecting the tightening in our monetary stimulus proxy seen from October 2010 to July 2011. We can use this false positive assessment to our advantage by setting a threshold ("0.42" black line in Figure 6) that, once probability surpasses this mark, can make us (more) confident in assessing that we are entering (or are already in) a recession (remember official GDP releases are delayed by at least two months after the referenced quarter).

Figure 7 – CRB Index Scenarios



Sources: Bloomberg, Santander.

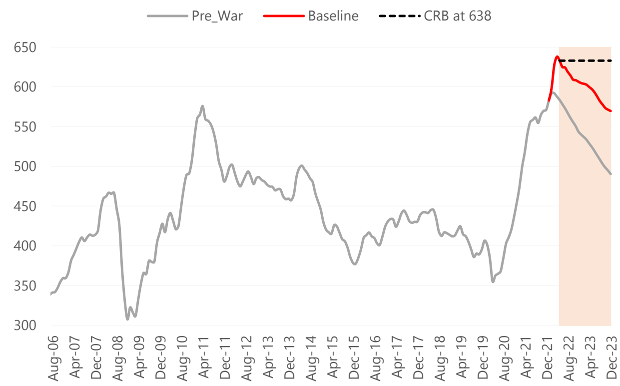
Figure 8 – Probability of Recession (out-of-sample)



Sources: Santander.

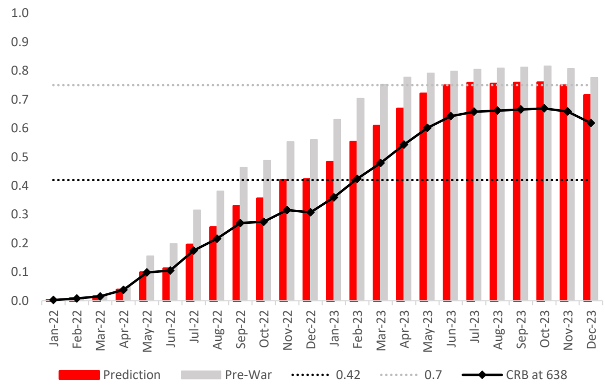
Returning to the aim of this report, we want to assess the probability of a recession in the coming quarters. We should bear in mind that, in mid-1Q22 our CRB path assumptions underwent steep upward revisions (see Figure 7) with the outbreak of the Russia-Ukraine conflict, as both countries are significant suppliers to commodity markets. Based on the historical correlation between rising commodity prices and the aforementioned domestic activity, we should expect a positive short-term impact on GDP, though with higher inflation. Indeed, considering our previous CRB scenario (along with our monetary stimulus path), our forecast path suggested that the probability of recession will touch and surpass the threshold as early as 3Q22, reaching the 0.75 mark in 1Q23. When we replace this commodity path with our current CRB scenario, our forecast path suggests that the probability of recession will touch and surpass the threshold only at the end of 4Q22, reaching the 0.75 mark only in 2H23. In sum, these results suggest an improvement in the 2022 GDP growth outlook, at least from the standpoint of the probability of recession based on our framework, at the same time it highlights a gloomy outlook for domestic activity in the forthcoming year, when the country will hardly be able to avoid a more serious recessionary picture in the absence of additional economic drivers.

Figure 9 – CRB Index Scenarios



Sources: Bloomberg, Santander.

Figure 10 – Probability of Recession (out-of-sample)



Sources: Santander.

Our last exercise in this report stressed our baseline scenario with a positive commodity shock, assuming that our CRB path hypothetically stays flat, at 638 (May's average reading) in the coming quarters. As expected, our recession probability path is downwardly shifted (black line), surpassing the threshold only in mid-1Q23 and remaining below the 0.75 mark throughout the entire forthcoming year. That said, based on this exercise, a positive commodity shock could thwart a recession in 2022 but hardly avoid a serious recessionary picture in 2023, as the delayed effect of a tight monetary policy materializes and prevails.

Finally, we note that this report comes on the heels of our last scenario review[4], where we raised our 2022 GDP growth forecast to +1.2% (from +0.7% previously) and lowered our 2023 estimates to -0.6% (from -0.3% previously). We issue this update partly in light of the widespread positive surprises that improved the 1H22 outlook, even considering our already optimistic expectations. However, we can also attribute a proportion of our upward revisions to improvement in 2H22, since we now see tight monetary policy stance effects hitting the economy more prominently in 4Q22, in contrast to our previous scenario update, when we foresaw a retreat as early as 3Q22. Moreover, our lowered estimates for 2023 reflect our recessionary outlook throughout 2023, mainly in 1H23 and is in line with the results we arrived at in this report. Although we recognize upsides risks to our 2022 forecast (mainly in 2Q22 and 3Q22), a gloomy outlook for 2023 seems each time more plausible.

[4] **Santander Brazil Economic Activity - *"Scenario Review: A Bittersweet Scenario"* –** June 02, 2022 - Available on: https://bit.ly/Std-scenreview-jun22

CONTACTS / IMPORTANT DISCLOSURES

Brazil Macro Research			
Ana Paula Vescovi*	Chief Economist	anavescovi@santander.com.br	5511-3553-8567
Mauricio Oreng*	Head of Macro Research	mauricio.oreng@santander.com.br	5511-3553-5404
Jankiel Santos*	Economist – External Sector	jankiel.santos@santander.com.br	5511-3012-5726
Ítalo Franca*	Economist – Fiscal Policy	italo.franca@santander.com.br	5511-3553-5235
Daniel Karp Vasquez*	Economist – Inflation	daniel.karp@santander.com.br	5511-3553-9828
Tomas Urani*	Economist – Global Economics	tomas.urani@santander.com.br	5511-3553-9520
Lucas Maynard*	Economist – Economic Activity	lucas.maynard.da.silva@santander.com.br	5511-3553-7495
Felipe Kotinda*	Economist – Commodities	felipe.kotinda@santander.com.br	5511-3553-8071
Gabriel Couto*	Economist – Special Projects	gabriel.couto@santander.com.br	5511-3553-8487
Fabiana Moreira*	Economist – Credit	fabiana.de.oliveira@santander.com.br	5511-3553-6120
Gilmar Lima*	Economist – Modeling	gilmar.lima@santander.com.br	5511-3553-6327
Global Macro Research			
Maciej Reluga*	Head Macro, Rates & FX Strategy – CEE	maciej.reluga@santander.pl	48-22-534-1888
Rodrigo Park *	Economist – Argentina	rpark@santander.com.ar	54-11-4341-1272
Ana Paula Vescovi*	Economist – Brazil	anavescovi@santander.com.br	5511-3553-8567
Juan Pablo Cabrera*	Economist – Chile	jcabrera@santander.cl	562-2320-3778
Guillermo Aboumrad*	Economist – Mexico	gjaboumrad@santander.com.mx	5255-5257-8170
Piotr Bielski*	Economist – Poland	piotr.bielski@santander.pl	48-22-534-1888
Mike Moran	Head of Macro Research, US	mike.moran@santander.us	212-350-3500
Fixed Income Research			
Juan Arranz*	Chief Rates & FX Strategist – Argentina	jarranz@santanderrio.com.ar	5411-4341-1065
Mauricio Oreng*	Senior Economist/Strategist – Brazil	mauricio.oreng@santander.com.br	5511-3553-5404
Juan Pablo Cabrera*	Chief Rates & FX Strategist – Chile	jcabrera@santander.cl	562-2320-3778
Equity Research			
Miguel Machado*	Head Equity Research Americas	mmachado@santander.com.mx	5255 5269 2228
Alan Alanis*	Head, Mexico	aalanis@santander.com.mx	5552-5269-2103
Andres Soto	Head, Andean	asoto@santander.us	212-407-0976
Walter Chiarvesio*	Head, Argentina	wchiarvesio@santanderrio.com.ar	5411-4341-1564
Mariana Cahen Margulies*	Head, Brazil	mmargulies@santander.com.br	5511-3553-1684
Murilo Riccini*	Head, Chile	murilo.riccini@santander.cl	56 22336 3359
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