

FORECASTING PROBABILITY OF RECESSION IN BRAZIL WITH FINANCIAL CONDITIONS

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- At the end of 1H22, we wrote a piece presenting a recession probability tracker for Brazil based on monetary policy and the path of commodities prices set in our baseline scenario at the time. The first result of the report suggested that the steep upward revisions in our commodities prices assumptions postponed the probability of recession to the end of this year and onward. The second result suggested that even if commodities prices remained hypothetically flat at an all-time high level from 2H22 until YE2023, the Brazilian economy would hardly avoid a recession in 2023 as the delayed effect of a tight monetary policy materializes and prevails.
- In order to improve this analysis, we launched a new tracker of recession probability for Brazil based now on lagged values of our financial conditions indicator (FCI). Financial conditions include not only domestic interest rates and commodities prices, but also several other domestic and external financial data that reflect both the current situation and expectations regarding future economic activity, considering agents valuations obtained through forward-looking analysis.
- Despite the strong monetary tightening seen in Brazil, domestic financial conditions remained loose until mid-1H22, owing mainly to external tailwinds, and our tracker corroborated the healthy stream of domestic activity in the first half of the year. However, since end-1H22 we have been seeing domestic financial conditions entering a contractionary field, now facing both domestic and external headwinds, and our tracker implied a rising recession probability across 3Q22. Moreover, the recession probability surpassed our false positive threshold in October and for 1Q23 it reached the same levels seen during the worst moments of the 2014-16 recession in Brazil.
- Our FCI has experienced some relief at the margin but remains seriously restrictive, and the outlook remains discouraging from YE2022 and onwards. The (lagged) contractionary effects on domestic activity started to kick in throughout 3Q22, hitting mainly goods-related sectors, and the available data for 4Q22 point to a continued loss of steam for cyclical activities. We expect these unstable financial conditions to continue compromising the cyclical activities next year.
- We forecast GDP growth in 2023 at +0.8%, with a significant slowdown in domestic demand and in cyclical supply components, stemming mainly from the expected global recession and the tight Brazil Central Bank (BCB) policy, but we also expect strong growth for non-cyclical farm output, reflecting an all-time high forecast for the grain harvest.

IMPORTANT DISCLOSURES/CERTIFICATIONS ARE IN THE "IMPORTANT DISCLOSURES" SECTION OF THIS REPORT.

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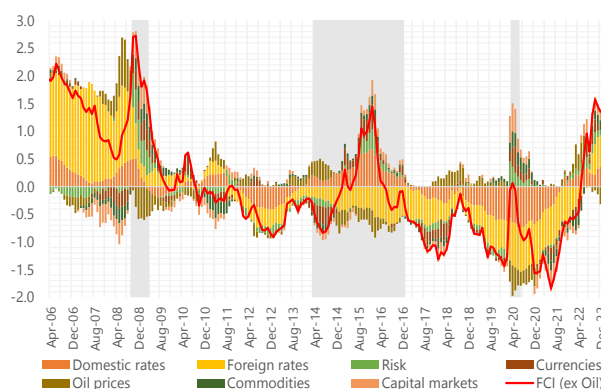
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On June 6, we wrote a piece presenting a recession probability tracker¹ for Brazil based on our baseline scenario at the time for domestic monetary policy, inflation expectations and commodities prices. The context was of widespread positive surprises in economic activity releases across 1Q22 and early 2Q22, topping our already optimistic expectations and reinforcing the likelihood of our resilient 2022 GDP outlook amid virtual null market consensus for GDP growth this year. The first result of this report suggested that the steep upward revisions in our commodities prices assumptions (amid the outbreak of the Russia-Ukraine conflict, as both countries are significant suppliers to commodity markets) postponed the probability of recession to the end of this year and onward. The second result suggested that even if a positive commodity shock occurred that prices stayed hypothetically flat at an all-time high level from 2H22 until YE2023, the Brazilian economy would hardly avoid a recession in 2023 as the delayed effect of a tight monetary policy materializes and prevails.

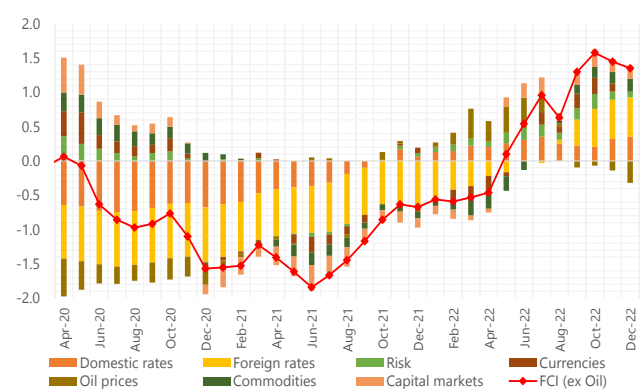
In order to improve this analysis, we launched a new tracker of recession probability for Brazil based now on lagged values of our financial conditions indicator (FCI)². Financial conditions are a broader concept that contemplate not only domestic interest rates and commodities prices, but also include several other domestic and external financial assets data that reflect both the current situation and expectations regarding future economic activity, considering agents valuations obtained through forward-looking analysis. Indeed, our FCI also includes data for stock exchanges indexes, currencies, and risk measures variables, weighting them according to their prediction accuracy in forecasting economic activity ahead (for inflation, the relationship maybe ambiguous).

Figure 1 – Santander’s FCI (from 2006 to 2022)



Sources: Bloomberg, BCB, Santander. * Grey area means recession dated by CODACE/FGV.

Figure 2 – Santander’s FCI (from 2020 to 2022)



Sources: Bloomberg, BCB, Santander

Regarding the methodology of our recession tracker, we made use of a Logit framework. 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 (Economic Cycle Dating Committee)³, while for the explanatory variable, we considered the three-month lagged values for our FCI. We established our model considering the period of January 2008 to March 2020, using a total sample size of 147 monthly observations, and Figure 3 below presents the in-sample fit. We focus attention on three periods in our sample. In the first marked period, we see a sharp increase in the probability of recession, leaping from 0.38 in August 2008 (before the recession period) to 0.81 in February 2009. In the second marked period, we see another sharp increase in the probability of recession, with a leap from 0.19 in January 2015 to 0.32 in June 2015 and reaching 0.57 in April 2016. However, despite this relatively good in-sample fit adjustment, we also see a period when the probability of recession sharply increased during a period not dated with an effective recession. Indeed, the probability of recession rose from 0.25 in February 2010 to 0.39 in September 2010, suggesting a false positive assessment in our model and likely reflecting the tightening in financial conditions seen from January 2010 to May 2010 amid the European Debt Crisis. We can use this false positive assessment to our advantage by setting a

¹ Santander Brazil Special Report: “A Model to Forecast Probability of Recession in Brazil” – June 08, 2022 – Available on: <https://bit.ly/Std-special-060822>

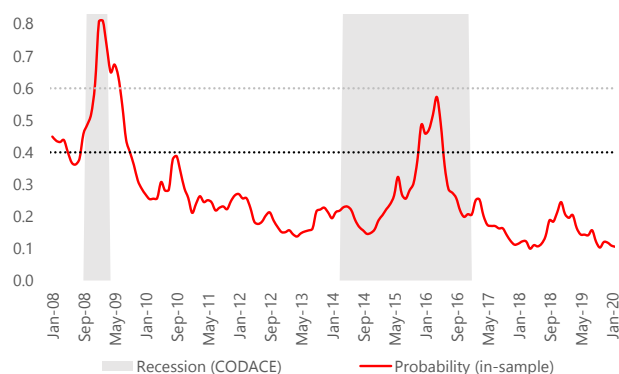
² Santander Brazil Economic Activity: “Financial Conditions Remain Critically Restrictive” – November 30, 2022 – Available on: <https://bit.ly/Std-FCI-nov22>

³ The first recession dated period comprises 4Q08 to 1Q09; the second one comprises 2Q14 to 4Q16; and the third one refers to 2Q20.



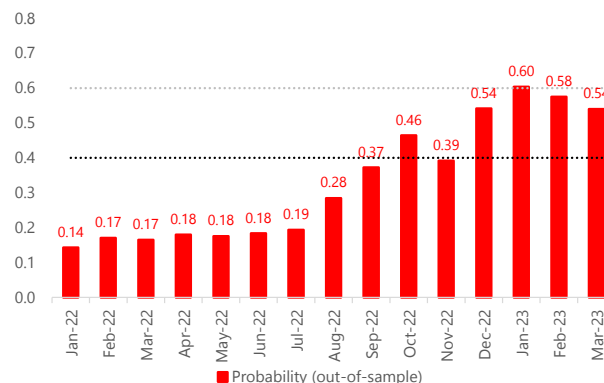
threshold (“0.4” black line in Figure 3) that, once probability surpasses this mark, can make us (more) confident in assessing that we are entering (or are already in) a recession (remember official GDP releases are delayed by at least two months after the referenced quarter).

Figure 3 – Logit Model Fitted-Values (in-sample)



Sources: FGV, Bloomberg, Santander.

Figure 4 – Probability of Recession (out-of-sample)



Sources: Santander.

In this exercise, our out-of-sample range comprises the period from January 2022 to March 2023. Despite the strong monetary tightening seen in Brazil, domestic financial conditions remained loose until mid-1H22 owing mainly to external tailwinds, and our tracker corroborated the healthy stream of domestic activity (pointing to recession probability below 0.2 until July) in 1H22. However, since end-1H22 we have seen domestic financial conditions entering in the contractionary field, now facing both domestic and external headwinds, with our tracker rising recession probability across 3Q22. Moreover, recession probability surpassed our false positive threshold in October and reached for 1Q23 the same levels seen in the worst moments of Brazilian 2014-16 recession.

Our FCI has experienced some relief at the margin but remains seriously restrictive, and the outlook remains discouraging from YE2022 and onwards. The (lagged) contractionary effects on domestic activity started to kick in throughout 3Q22, hitting mainly goods-related sectors, and the available data for 4Q22⁴ points to a continued loss of steam for cyclical activities. We anticipate that these shaky financial conditions will continue to compromise cyclical activities next year. We forecast GDP growth in 2023 at +0.8%, with a significant slowdown in domestic demand and in cyclical supply components, stemming mainly from the expected global recession and the tight BCB policy, but we also expect strong growth for non-cyclical farm output, reflecting an all-time high forecast for the grain harvest.

⁴ **Santander Brazil Economic Activity: “IGet: Serviços confirmam expectativa de contração em dezembro”** – January 03, 2023 – Available (in Portuguese) on: <https://bit.ly/Std-IGETser-dez22>

Santander Brazil Economic Activity: “IGet: Atividade varejista enfraquece em dezembro” – December 20, 2022 – Available (in Portuguese) on: <https://bit.ly/Std-IGET-p-dez22>

Santander Brazil Special Report: “Santander’s Monthly Activity Indicator Entered Restrictive Territory in October” – January 03, 2023 – Available on: <https://bit.ly/Std-special-010323>



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