Brazil: Are lower interest rates the new normal?

- We estimate a real neutral interest rate of 2.5% to 3%. Maintaining this level will depend on continued fiscal adjustment efforts.
- The reduction relative to the neutral interest rate estimates of the last decade can be attributed to a combination of financial deepening and stricter fiscal policy.
- Fiscal and quasi-fiscal incentives granted between 2009 and 2014 postponed the convergence of the real neutral interest rate to current levels.

Introduction

In 2015-16, the Brazilian economy faced two consecutive years of negative growth and high inflation. In 2017, the central bank managed to control inflation and anchor expectations, paving the way for interest rate cuts. Controlled inflation and an all-time low benchmark Selic rate made room for the beginning of the economic recovery. However, activity has accelerated less than expected since then. The moderate rebound starting in 2017 — following the deepest recession in Brazil since World War II and notwithstanding low interest rates — underscored the need to reassess the actual accommodation of monetary conditions. In other words, to review Brazil’s real neutral interest rate estimates.

Evidence: Lower interest rate and slower growth

We split the relationship between real interest rates and GDP growth into two periods: the first, before the 2008 crisis, was marked by high interest rates and high GDP growth; the second, from 2012 to 2018, shows slower growth and lower interest rates.

In economic theory, the “IS curve” is the relationship between real interest rates and economic growth. Chart 1 clearly shows that the IS curve shifted downward in the most recent period.

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1 Between 2009 and 2011, the relationship between real interest rates and growth was distorted by sharp fluctuations in global growth due to the financial crisis in the U.S. and fiscal stimuli in China in 2010.
Empirical Study I: Estimated IS curve for both periods

The IS curve can be described as follows:

\[ GDP_t = \alpha + \beta r_t \]  

Where \( GDP_t \) is annual GDP growth, \( r_t \) is the real interest rate during the period, and \( \alpha \) and \( \beta \) are parameters.

Chart 1 suggests that parameter \( \alpha \) (referred to as alpha in the rest of the text) changes over time. We will therefore use subscript \( t \) in alpha (\( \alpha_t \)). Our econometric specification considers the possibility of a shift in the IS curve:

\[ GDP_t = \alpha_n + \alpha_0 d + \beta r_t \]

Where \( d \) is a dummy variable with values 1 in 2003-08 and 0 in 2012-18. Note that:

\[ \alpha_t = \begin{cases} \alpha_n + \alpha_0 & \text{between 2003 and 2008} \\ \alpha_n & \text{between 2012 and 2018} \end{cases} \]

Table 1 shows the results:

<table>
<thead>
<tr>
<th>Explanatory Variable</th>
<th>Coefficient</th>
<th>Std Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \alpha_n )</td>
<td>5%</td>
<td>1%</td>
</tr>
<tr>
<td>( \beta )</td>
<td>-0.96</td>
<td>0.15</td>
</tr>
<tr>
<td>( \alpha_0 )</td>
<td>9%</td>
<td>1%</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>90%</td>
<td></td>
</tr>
</tbody>
</table>


Some results in Table 1 are quite interesting. First, there was a significant reduction in alpha in the most recent period. Our estimates suggest a 14% decline in 2003-08 (\( \alpha_n + \alpha_0 \)), to just 5% in 2012-18 (\( \alpha_n \)).

Second, interest rate elasticity to GDP is statistically -1 (i.e., \( \beta = -1 \)). This result is in line with our models, which incorporate other variables in the IS curve, such as global economic growth, corporate debt levels, financial asset prices, etc.

Given that \( \beta = -1 \), parameter alpha gets a simple reading. By replacing \( \beta = -1 \) in equation 1, we get:

\[ GDP_t = \alpha_t - r_t \]

Equation 4 shows that, if \( \beta = -1 \), alpha may be read as the interest rate that produces zero economic growth. In other words, the interest rate in 2003-08 had to exceed 14% to push the economy into a recession. In 2012-18, a real interest rate above 5% would be enough to drive the economy to negative growth.
Empirical Study II: Continuous shift of the IS curve over time

In the previous section, we randomly divided our sample into two periods. However, parameter alpha probably experienced this dislocation gradually and continually over time, instead of leaping between the two periods that were randomly defined.

We therefore propose an alternative methodology to determine how parameter alpha in equation 1 evolved.

Going back to equation 1, we assumed that beta in this equation equals -1 (consistent with table 1). Equation 4 is therefore valid and the understanding of alpha as the interest rate that leads to zero growth is sustained. Equation 4 may be rewritten in the following manner:

\[ \alpha_t = GDP_t + r_t \]

\( GDP_t \) and \( r_t \) are observable variables, so we can infer alpha by simply adding actual GDP growth and the real interest rate and checking this value over time. Chart 2 shows the evolution of alpha according to equation 5 (i.e., “continuous” shift of the IS curve) and to equation 3 (“discrete” shift of the IS curve):

![Chart 2 - Alpha (interest rate that produces zero economic growth)](source: tau)

Alpha hovered around 14% in 2003-08 and then experienced greater instability due to the external backdrop. Alpha has been around 4.8% since 2012 (4.6% in 3Q18).

What’s behind the slide in parameter alpha over time?

To explain the slide (and equivalent shift of the IS curve), we regressed alpha (calculated as the sum of actual interest rate and growth – refer to equation 5) in four variables: non-earmarked loans, capital market, government spending and expansion of development bank BNDES’s balance sheet (shown in charts 3.1 to 3.4).

The two first variables represent the financial deepening effect on the IS curve. The expansion of credit as a share of GDP tends to dislocate the credit supply curve. This dislocation in turn shifts the IS curve, reducing the equilibrium interest rate. Non-earmarked loans increased as a share of GDP until 2012, and notwithstanding the retreat in recent years, it remains considerably above the 2002-10 average. The capital market variable (details in Appendix 1) receded until 2007, as external debt became less relevant, then started a slow recovery in 2007.

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2 Appendix 1 details variables used in regressions and charts.
The following variables represent incentives to aggregate demand through fiscal and quasi-fiscal stimuli, which had to be offset by higher real interest rates. Government spending increased at a real annual pace of 6.3% in 2003-08 and slipped into stagnation in 2015-17. BNDES expanded new loans from slightly less than 2% of GDP to 4% in 2010, and has been reducing new loans ever since.

Table 2 shows regression results. The two variables associated with financial deepening have negative coefficients, while the two variables associated with fiscal incentives for demand have positive coefficients, as expected.
Chart 4 compares actual and fitted values for alpha.

Model results suggest that fiscal incentives offered in 2009-14 contributed to the increase in the real neutral interest rate, preventing a faster convergence to lower levels consistent with the financial deepening cycle (chart 5).

### Real Neutral Interest Rate Receded From 10% in 2003-08 to About 3% Since 2012

Results in the previous section explained the slide in alpha (i.e., interest rate level that leads to zero growth) over time. Based on these results, we can calculate the neutral interest rate.

Before that, however, it is worth mentioning the definition of two variables:

- **Potential growth**: GDP growth rate with stable utilization of production factors at typical levels.
- **Neutral interest rate**: interest rate that leads the economy to its potential growth rate.

To estimate the neutral interest rate, based on the abovementioned definitions and on equation 5, we have:

\[ r_t^* = \alpha_t - GDP_t^* \]

In equation 6, \( r_t^* \) is the real neutral interest rate and \( GDP_t^* \) is potential growth.
In Macro Vision: Reforms Could Bring Brazil’s Potential GDP to 3.5%, we discuss potential growth since 1961.

In that report, we estimated potential growth of 3.4% for 2003-08, leading to an estimated real neutral interest rate of 10% in that period.

In 2012-18, alpha averaged 4.8%. Potential growth of 1.6% (our estimate for the period) therefore leads to a real neutral interest rate of around 3%.

Based on alpha early in 4Q18 (4.6%), and assuming potential growth3 between 1.5% and 2.0%, the real interest rate is between 2.5% and 3.0%.

Importantly, maintaining this neutral real interest rate — finally near that of other emerging market economies — will depend on continued fiscal adjustment efforts. Along with the direct effect that fiscal neglect would have on alpha (and consequently on the neutral interest rate), potential growth would be lower (see the abovementioned report). Furthermore, macroeconomic disarrangement caused by fiscal neglect would erase the progress in terms of financial deepening seen since the beginning of the previous decade.

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Appendix 1 – Variables Used in Regressions

Real Interest Rate: Swap pre x 360-day DI, adjusted by the estimated consumer price index IPCA for the next 12 months (according to the Central Bank Focus survey).

GDP Growth: Annualized quarterly growth of our underlying economic activity indicator.

Non-Earnarked Loans: Financing contracts and loans at market interest rates (agreed upon freely by financial institutions and borrowers). In these transactions, financial institutions have autonomy in terms of lending funds raised in the market. Figures presented as a share of nominal GDP over a 12-month period.

Capital Market and External Debt: The Bank for International Settlements (BIS) publishes a series with all sources of credit for the non-financial private sector as a share of nominal GDP. From this series, we subtracted bank credit as a share of nominal GDP (published by the Brazilian Central Bank), leaving only capital market and external debt.

BNDES: New loans by BNDES in the last 12 months as a share of nominal GDP in the period.

Government spending: Year-over-year growth in total government spending, adjusted by the IPCA.

3 In the previously mentioned report, we argue that progress in reforms could boost potential growth in Brazil.
Appendix 2 – Alternative Regression (Differences)

We also tried to explain the difference in alpha based on the difference in other variables. The alternative model presented similar coefficients to those of the level-based model (see table below).

<table>
<thead>
<tr>
<th>Explanatory Variable (first diff)</th>
<th>Coefficient</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-earmark loans (%GDP) (-1)</td>
<td>-1.1</td>
<td>0.4</td>
</tr>
<tr>
<td>Capital market and external debt (%GDP) (-1)</td>
<td>-0.4</td>
<td>0.2</td>
</tr>
<tr>
<td>New loans by BNDES (%GDP)</td>
<td>2.9</td>
<td>1.1</td>
</tr>
<tr>
<td>Increase in government spending</td>
<td>0.2</td>
<td>0.1</td>
</tr>
<tr>
<td>Constant</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>MA (1)</td>
<td>-0.5</td>
<td>0.1</td>
</tr>
</tbody>
</table>

| R²                                             | 15%         |

Frequency: quarterly. Method: ARMA Conditional Least Squares (Marquardt)

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