

Brazil: Exchange Rate

Monetary Easing: The BRL Is the Limit

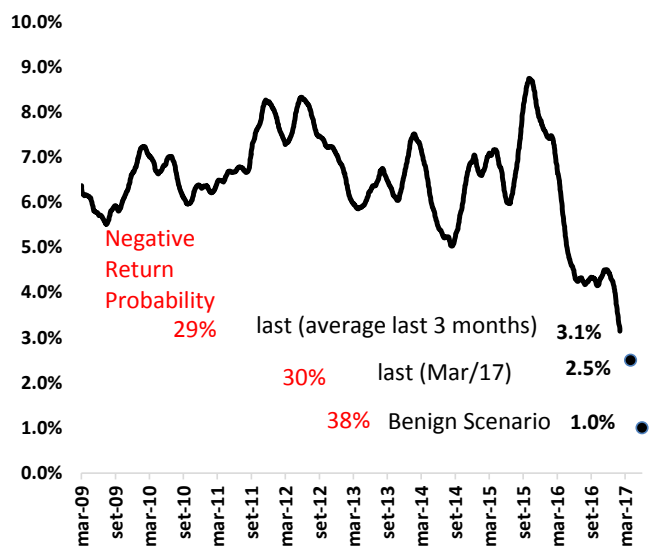
Maurício Molan*

mmolan@santander.com.br

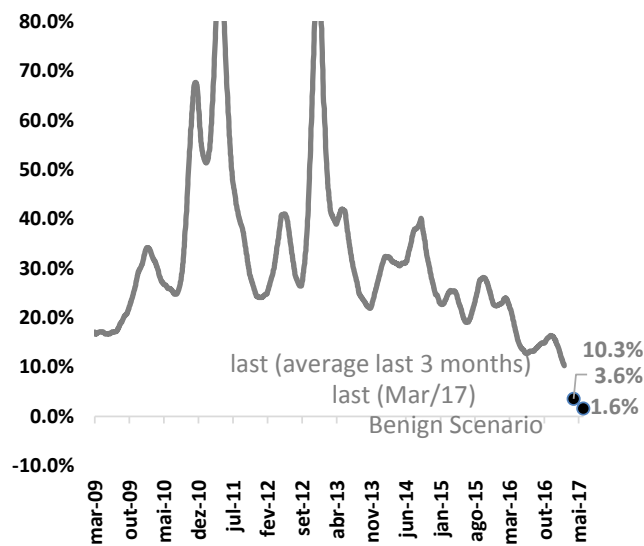
+55 11 3012-5724

- We believe that Brazil is well positioned to enter a new era in terms of sustainably low inflation and interest rates, particularly due to a credible monetary policy, in a context of the very low utilization of production factors.
- Without major exogenous shocks on risk premiums and the exchange rate, we see room for the real interest rate to converge toward or even (for quite some time) below its neutral level.
- We call attention to the fact that this new paradigm could lead to a significant compression of the FX risk premium, increasing the probability of a negative return from local fixed income investments vis-a-vis offshore alternatives, thereby leading to a more meaningful and direct impact of monetary policy on the exchange rate.
- Our estimations suggest that without meaningful additional CDS improvement and a credible inflation target reduction, the new equilibriums for 5-year yields and the Selic could not be much lower than, respectively, 9% and 8%.

Expected FX Risk Premium and Probability of Negative Return



Return / Risk
FX Risk Premium / Probability of Negative Return



Source: Santander estimates based on BCB data.



Selic X BRL

Although economic theory emphasizes the importance of interest rate differentials for exchange rate dynamics, in the case of Brazil, this variable usually fails to prove significant with respect to most econometric models used to estimate or explain BRL dynamics.

That is not to say that the monetary policy transmission channel of the currency does not work, instead probably meaning that this relationship has varied considerably over the many years since the start of a floating FX (back in 1999).

It would appear that this is a classic example of the difference between correlation and causality: even when it is possible to establish a correlation between these two variables, it is still often hard to identify the direction of the causality between the BRL and the Selic or whether or not a third variable is at play. This uncertainty appears to be of particular importance in a country with considerable (default) risk, inflation variation and low capital mobility, such as is the case with Brazil.

One way to approach this conundrum is to consider both variables as exogenous in the estimation of other macro relationships, as does the Brazilian Monetary Policy Committee with its inflation forecasts disclosed in the communiqués released after the meetings and in the Quarterly Inflation Report. Another approach is to consider that other factors (such as risk premiums, expectations, FX volatility, etc.) may be much more relevant in defining at the same time both the BRL and the Selic (through the impact on expected inflation and GDP in the BCB's reaction function).

In any case, we call attention to the fact that the monetary policy rate is hardly used as an explanatory variable in most BRL models, and the BRL itself is usually taken as exogenous to inflation forecasts.

We believe, however, that it is worth taking a closer look at the role of interest rates in the setting of the exchange rate, particularly in a moment when we witness: (i) a discussion about the level of neutral interest rates in Brazil; (ii) the prospects of aggressive monetary policy easing; and (iii) uncertainty regarding how low the Selic will be at the end of this cycle.

We argue that the difficulty in quantifying the relationship between the Selic and the BRL does not mean that the Brazilian exchange rate will be unresponsive to the current process of monetary policy easing. Actually, given the current substantial slack in production factors, we believe the currency, and not domestic demand, will be the determinant in defining how low the base rate could go.

FX Risk Premium

In this piece, we attempt to show that FX risk premiums embedded in Brazilian yields have usually been adequate enough to prevent the setting of Selic rates from moving forward enough to change substantially the risks/rewards of investing locally or abroad.

- **Offshore:** Consider a fixed income investor who decides to buy a Brazil Treasury bond either locally or abroad. The **expected return** of the offshore investment, as measured in USD, would be approximately the risk free rate (usually proxied by a **Treasury bond**), plus a measure of risk (default) proxied by the **CDS**.
- **Local:** The alternative **expected return** (in foreign currency) for the same type of investment, but in local markets, is the yield denominated in BRL, such as a **swap**, minus the **forecast variation of the exchange rate**.

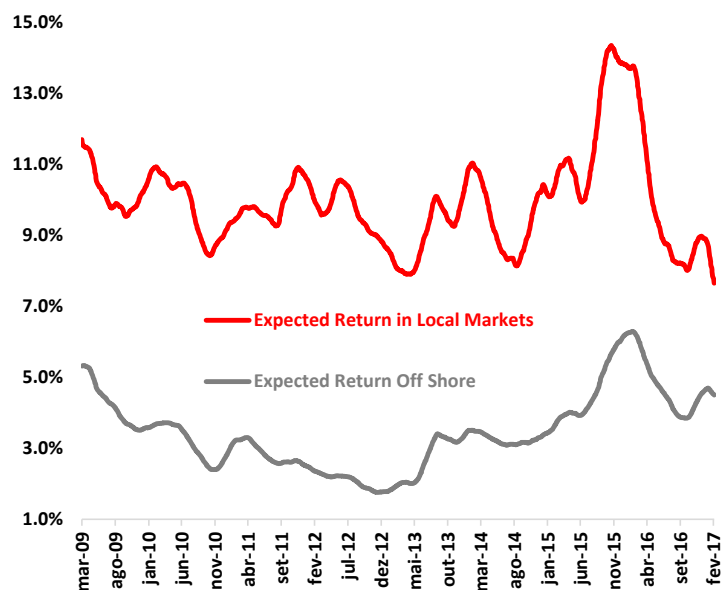
The difference between the expected yield in local vis-a-vis the offshore market is the premium required by investors, mostly associated with uncertainties regarding FX movements. Of course, this component should also include transaction costs, cross-border risk, uncertainties related to jurisdiction, taxation, etc. However, the most important component is certainly the one associated with unexpected FX movements.

If the investor is risk averse, the preference for the local market requires not only a positive FX risk premium, but a premium high enough to compensate for the possibility of a negative outcome.

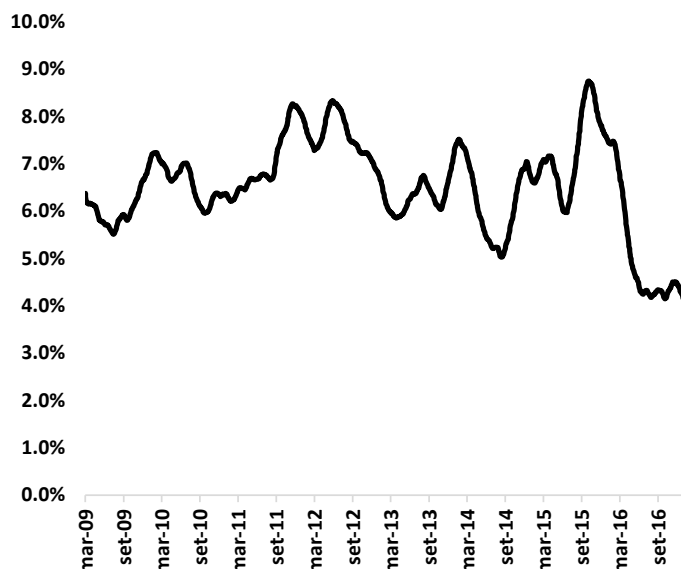
The following charts illustrate the behavior of all these aforementioned variables since 2009. We have considered 5-year Treasury yields, the 5-year CDS of Brazilian Treasury bonds, 5-year local swaps for LTN (zero-coupon, fixed rate public bond), and the expected BRL variation at each moment based on the Focus survey. All variables are expressed in % p.a..



**Expected Returns (% p.a. in 5 years)
Local Markets (yields in BRL [-] Expected BRL
variation) and Offshore (Treasury + CDS)
3-month moving average**



**FX Premium (returns in local market [-] offshore)
3-month moving average**



Source: Santander estimates based on BCB data. Data goes up to March 3, 2017.

It should not be a surprise to see how generous returns have been during the analyzed period (in fact, while we do not have the data to build a longer series, we believe this may apply to most of the free floating exchange regime). Beyond an expected exchange rate devaluation not far from expected inflation, investors could stomach an additional 6 p.p. per year, on average, before starting to lose money (assuming other than default risks = 0) vis-a-vis an alternative offshore investment.

P&L Probabilities

By introducing currency volatility into our analysis, it is possible to estimate probabilities associated with different scenarios based on the magnitude of risk premiums and BRL volatility at each moment.

The following table and charts illustrate the mechanism. We have considered figures as of the end of February, with all variables denominated in % p.a. for a period of five years.

Current Situation

Local	Swap: 10%	(-) Expected BRL variation: -3.5%	Expected return local: 6.5%	FX risk premium: 2.5%	BRL volatility (3 months standard deviation, annualized): 11.4%
Offshore	Treasury: 1.8%	CDS: 2.2%	Expected return off shore: 4%		

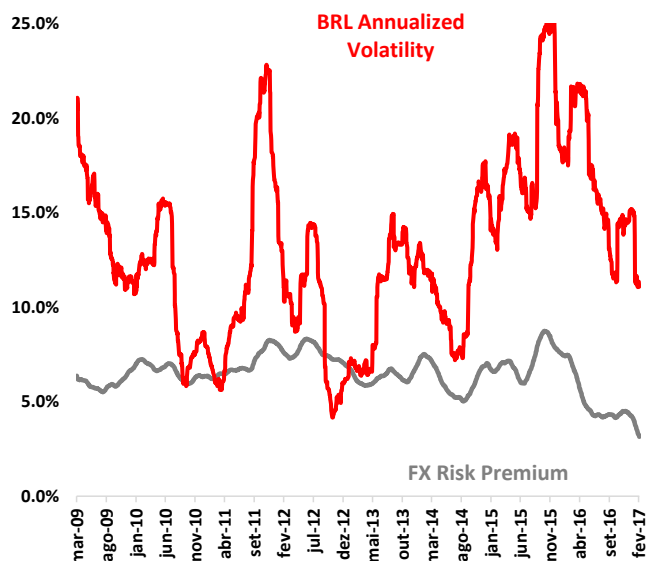
Source: Santander.

Our simulation indicates that investors would lose money in local markets if the BRL depreciates by more than 6% per year (which is the swap yield (-) Treasury (-) CDS). Therefore, the probability of a negative result is the probability of BRL varying above 6% per year. The flipside of the same coin is that investors could obtain a higher-than-expected return if the BRL depreciates less than expected (3.5% in our example).

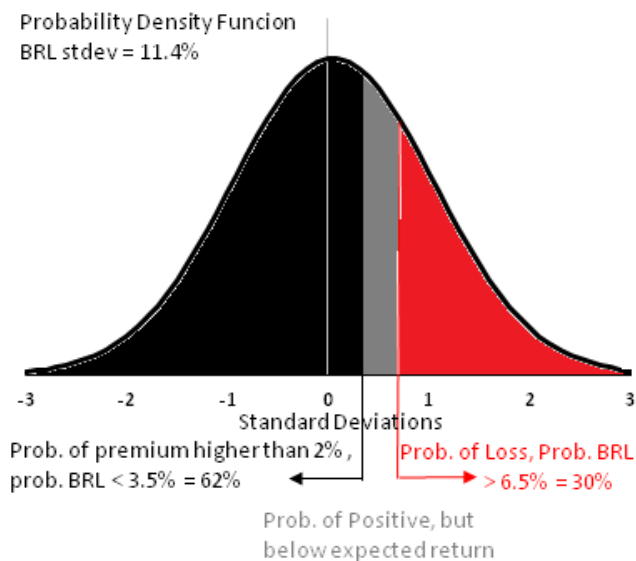
According to our estimation, and including BRL volatility in our analysis, the probability of obtaining returns above 2.5% per year investing locally by the end of February was around 62%, while the probability of a negative outcome was 30%. The remaining 8% would be the probability of a positive, but below expectations return.



FX Premium and Annualized BRL Volatility



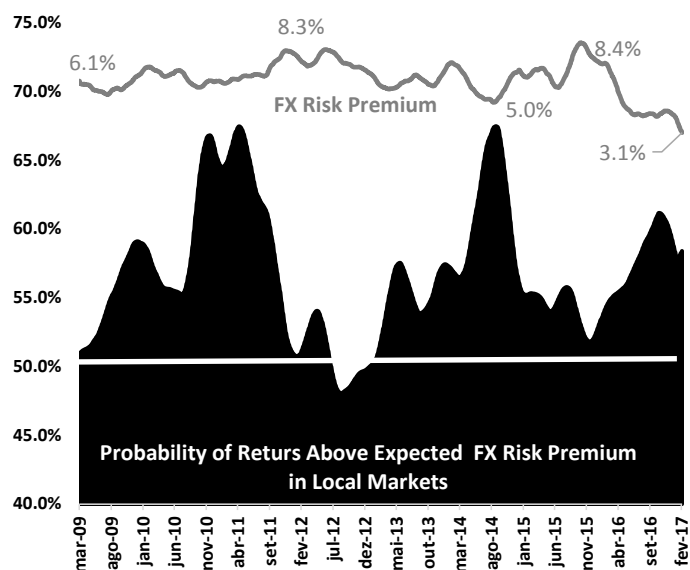
Standard Normal Distribution



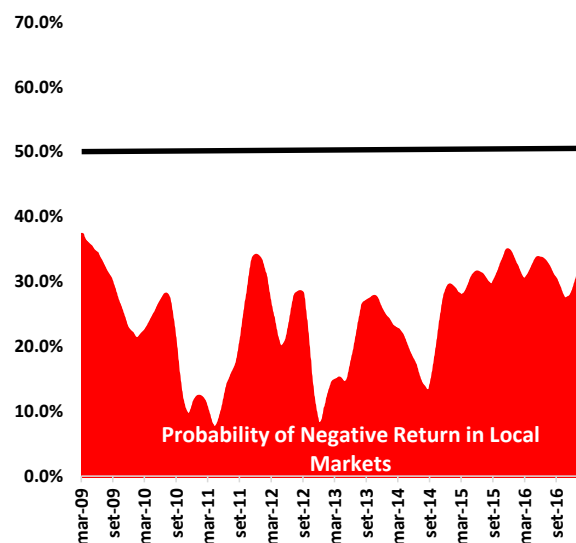
Source: Santander estimates based on BCB data.

The following charts show both probabilities estimated at each moment since 2009, using actual 3-month moving average data for each proxy and 63 working days annualized standard deviation for the BRL.

FX Risk Premium and Probabilities of Returns Above It



Probability Associated to Negative Returns in Local Markets vis-a-vis Offshore

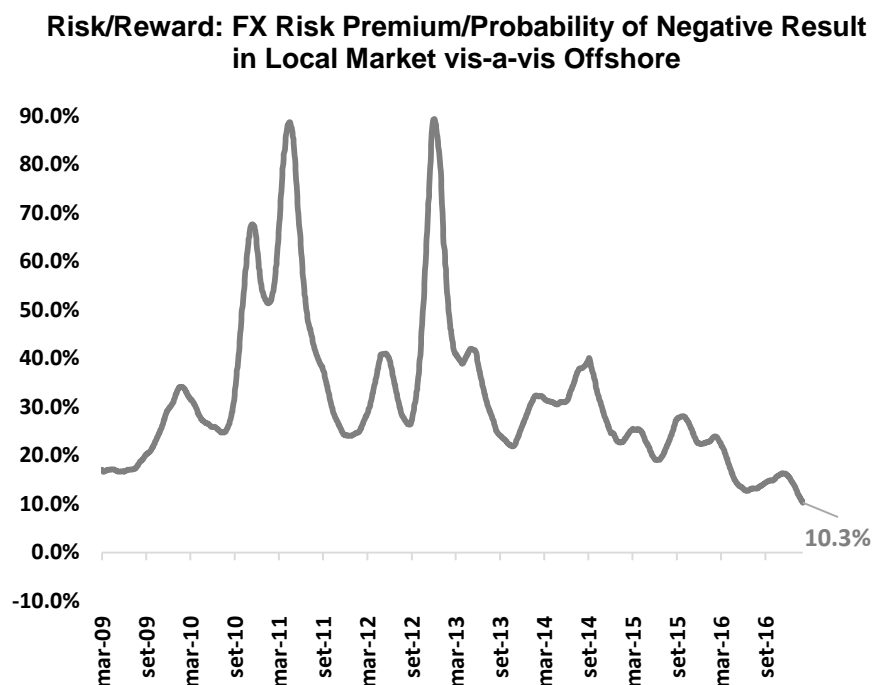


Source: Santander estimates based on BCB data.



It is easy to see how risk premiums have been generous in the period, with associated probabilities comfortably above 50% and the likelihood of a negative outcome in local markets almost never above 30%. Even after the recent substantial compression of local yields, although premiums were reduced by almost half of what they used to be, the reduction of BRL volatility was enough to maintain the probability of negative returns in local markets not far from 30%.

The following chart is a way of composing, at the same time, the expected return and associated risk at each moment. This risk/reward index consists of the expected FX risk premium divided by the probability of a negative return in local market vis-a-vis offshore.



Source: Santander estimates based on BCB data. Data goes up to March 3, 2017.

Although not the main purpose of this report, one cannot resist the temptation to analyze and draw a few conclusions from the previous figures:

- 1) Since mid-2016, the FX premium adjusted for risk started falling more steeply, likely reflecting, in our view, improved confidence in Brazil's economy.
- 2) The outstanding peaks in terms of this measure (year-end 2010 to early 2011 and year-end 2012 to early 2013) were associated with unusually low BRL volatility, which sometimes is caused by BCB intervention in the FX markets.
- 3) During most of the time of our sample, premiums adjusted for risk have remained around 30%, meaning 0.3 p.p. of returns for each percentage point of probability of losing money in local markets vis-a-vis offshore.

A tentative explanation for the persistence of such a comfortable situation of expected returns for so long, even considering the FX risk, may have to do with monetary policy: Brazil's recent macro-economic history has been characterized by a continuous struggle to stabilize inflation at a low level in a context of a floating and volatile exchange rate. Therefore, it seems that the **policy rate** has remained, for most of the time, significantly above the "neutral level" (here considered from the point of view of uncovered interest rate parity, even after adding risk premium). This persistently elevated reference rate has certainly contributed to sustain higher yields and comfortable premiums in local markets.

Although fiscally expensive, this situation has contributed to the maintenance of most of the public sector debt being BRL-denominated and prevented substantial outflows by local investors.



What If?

But what if, different from what we have seen in the last 15 years, the near future is characterized by: (i) inflation at or below the target (no need to disinflate); (ii) relatively high slack in labor and capital (suggesting room to let domestic demand expand); and (iii) the absence of exogenous exchange rate shock.

In such an event, we believe that there would be room for a substantial reduction in the policy rate (i.e., the Selic), toward new levels that could compress premiums to a point where local instruments no longer offer a clearly advantageous risk/reward compared to offshore.

Let's consider the following scenario and compare it with the current situation:

Benign Scenario

Local	Swap: 9% (ad hoc assumption)	(-) Expected BRL variation: -3.5% (current)	Expected return local: 5.5%	FX risk premium: 1%	BRL volatility (3 months standard deviation, annualized): 15% (historical)
Off Shore	Treasury: 2.5% (ad hoc assumption)	CDS: 2.0% (ad hoc assumption)	Expected return off shore: 4.5%		

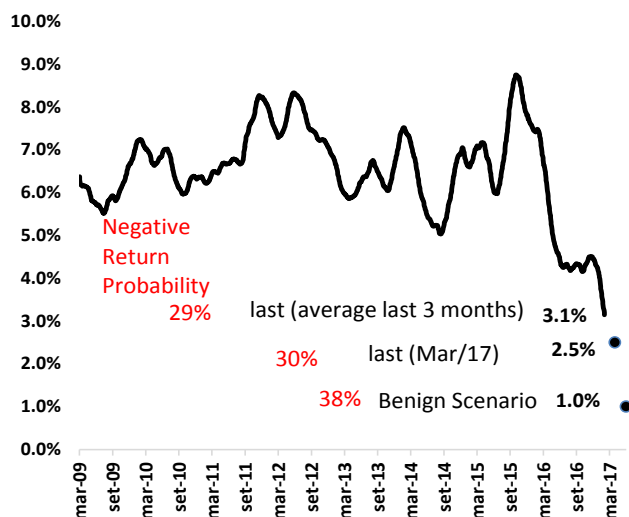
Current Situation

Local	Swap: 10%	(-) Expected BRL variation: -3.5%	Expected return local: 6.5%	FX risk premium: 2.5%	BRL volatility (3 months standard deviation, annualized): 11.4%
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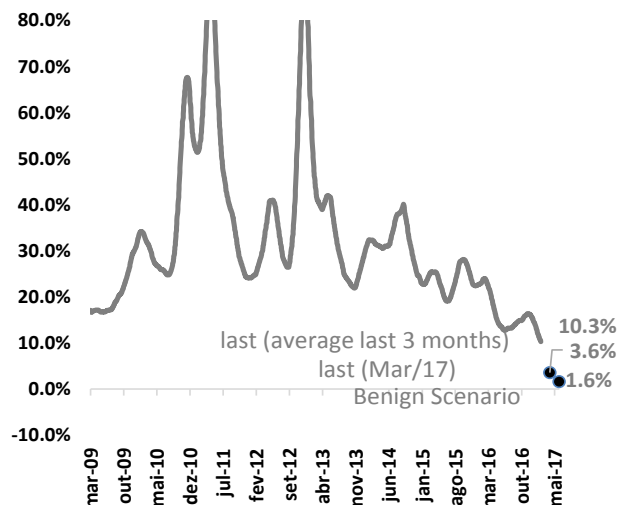
Source for both charts: Santander.

The following charts summarize what would be the historical, current and counterfactual situations in terms of risk premiums, probability of negative returns and our risk/reward index.

Expected FX Risk Premium and Probability of Negative Return



FX Risk Premium/Probability of Negative Return



Source: Santander estimates based on BCB data.

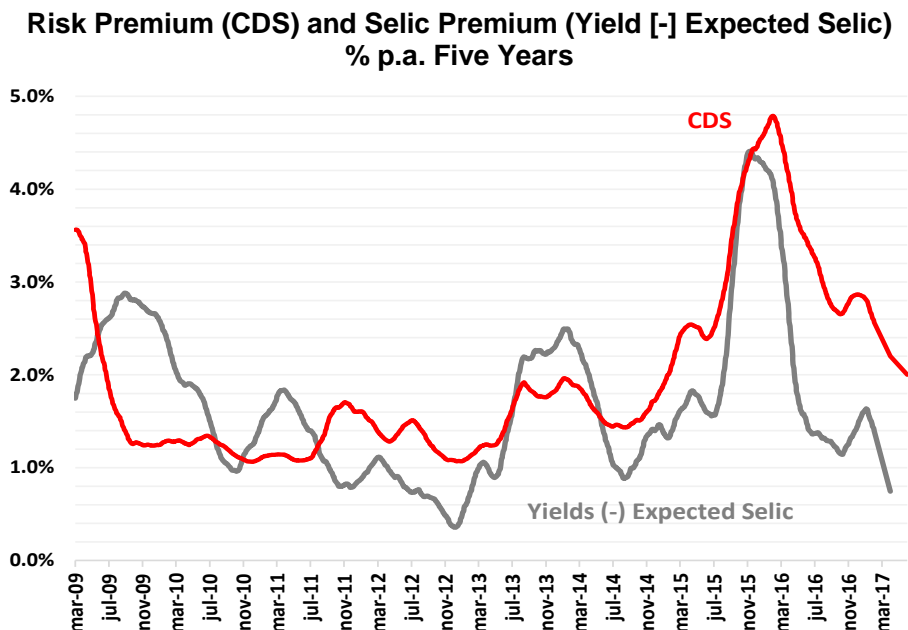
Our previous analysis suggests that without a more meaningful CDS improvement or expected variations for the BRL (which could be accomplished via a credible reduction in the inflation target), additional medium-term reductions (in this case, five years) in yields from current levels would substantially compress expected premiums of local fixed income investments vis-a-vis offshore as much as it would increase the probability of a negative outcome.



The Role of the Selic

We know that the actual Selic rate and its expected path, as dictated by monetary policy, ends up affecting forward points and the yield curve. We have argued that, so far, the past and current monetary easing cycles have not been enough to compress FX risk premium to a point where offshore investments become competitive vis-a-vis local instruments; however, this may no longer be true in the near future.

We also know that long-term yields are affected by the expected path of the base rate and a premium to incorporate uncertainties associated with this path (mostly also related to inflation surprises) and other risks (such as default). The following chart illustrates the evolution of the difference between 5-year yields and the average accumulated Selic as forecast by investors and compiled by the Focus survey. The chart also plots the CDS for the same period.



Source: Santander estimates based on BCB data. Data goes up to March 3, 2017.

In circumstances that could be considered as “normal”, with CDS not above 250 bps and reasonably stable, the premium of the 5-year swap vis-a-vis the expected Selic path seems to have oscillated between 1.0 to 2.0 p.p..

These results could suggest that yields approaching 9% and an expected Selic not far from 8% would probably be consistent with compressed FX risk premiums, which could pressure the currency by making offshore fixed income investments a better alternative than they have been in recent history.

This could mean that: (i) we may be approaching a new equilibrium level for medium-term yields, which may not be far from 9.0-9.5% per year; and (ii) although the BCB does not target the BRL per se, eventual depreciation pressure on the BRL resulting from the compression of FX risk premium could lead to inflationary pressure, thereby constraining further cuts to the Selic. In this sense, we believe that the BRL, and not economic slack, may represent a limit to the ongoing easing cycle.

Conclusion

Brazil is almost certainly converging to a new era in terms of sustainably low inflation and interest rates, in our view, particularly due to the credibility of the monetary policy and a very low level of utilization of production factors. Without a major exogenous shock on risk premiums and the exchange rate, we see room for the real interest rate to converge toward or even (for quite some time) below its neutral level.

We call attention to the fact that this new paradigm will probably lead to significant compression in FX risk premium for local fixed income investments vis-a-vis off-shore alternatives, which could lead to a more meaningful and direct impact of monetary policy on the exchange rate.

Our estimations suggest that without a meaningful additional improvement of CDS and a credible reduction of inflation targets, the new equilibriums for yields and the Selic could not be much lower than, respectively, 9% and 8%.



CONTACTS / IMPORTANT DISCLOSURES

Macro Research

Maciej Reluga*	Head Macro, Rates & FX Strategy – CEE	maciej.reluga@bzwbk.pl	48-22-534-1888
Sergio Galván*	Economist – Argentina	sgalvan@santanderrio.com.ar	54-11-4341-1728
Maurício Molan*	Economist – Brazil	mmolan@santander.com.br	5511-3012-5724
Juan Pablo Cabrera*	Economist – Chile	jcabrera@santander.cl	562-2320-3778
Brendan Hurley	Economist - Colombia	bhurley@santander.us	212-350-0733
David Franco*	Economist – Mexico	dafranco@santander.com.mx	5255 5269-1932
Tatiana Pinheiro*	Economist – Peru	tatiana.pinheiro@santander.com.br	5511-3012-5179
Piotr Bielski*	Economist – Poland	piotr.bielski@bzwbk.pl	48-22-534-1888
Marcela Bensión*	Economist – Uruguay	mbension@santander.com.uy	5982-1747-5537

Fixed Income Research

Brendan Hurley	Macro, Rates & FX Strategy – Latin America	bhurley@santander.us	212-350-0733
Juan Pablo Cabrera*	Chief Rates & FX Strategist – Chile	jcabrera@santander.cl	562-2320-3778
Nicolas Kohn*	Macro, Rates & FX Strategy - LatAm	nicolas.kohn@santanderibm.com	4420-7756-6633
Aaron Holsberg	Head of Credit Research	aholsberg@santander.us	212-407-0978

Equity Research

Christian Audi	Head LatAm Equity Research	caudi@santander.us	212-350-3991
Andres Soto	Head, Andean	asoto@santander.us	212-407-0976
Walter Chiarvesio*	Head, Argentina	wchiarvesio@santanderrio.com.ar	5411-4341-1564
Valder Nogueira*	Head, Brazil	jvalder@santander.com.br	5511-3012-5747
Pedro Balcao Reis*	Head, Mexico	pbalcao@santander.com.mx	5255-5269-2264

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