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Brazil has various price indices that were built over time with different objectives.

Liquid by Design—Building Brazilian Inflation-Linked Bond Indices

EXECUTIVE SUMMARY

- Historically, inflation has been a concern in Brazil. Inflation-linked bond strategies are commonly used by market participants as a way to manage changes in inflation; however, due to market constraints and limited trading volume, not all issuances are liquid.
- This paper focuses on sovereign inflation-linked bonds, their liquidity, and an alternative indexing solution proposal, which can be used to alleviate liquidity concerns.
- We introduce liquidity as part of the weighting scheme to an inflation-linked index, with results showing improved levels of investability and replicability of the index.

OVERVIEW

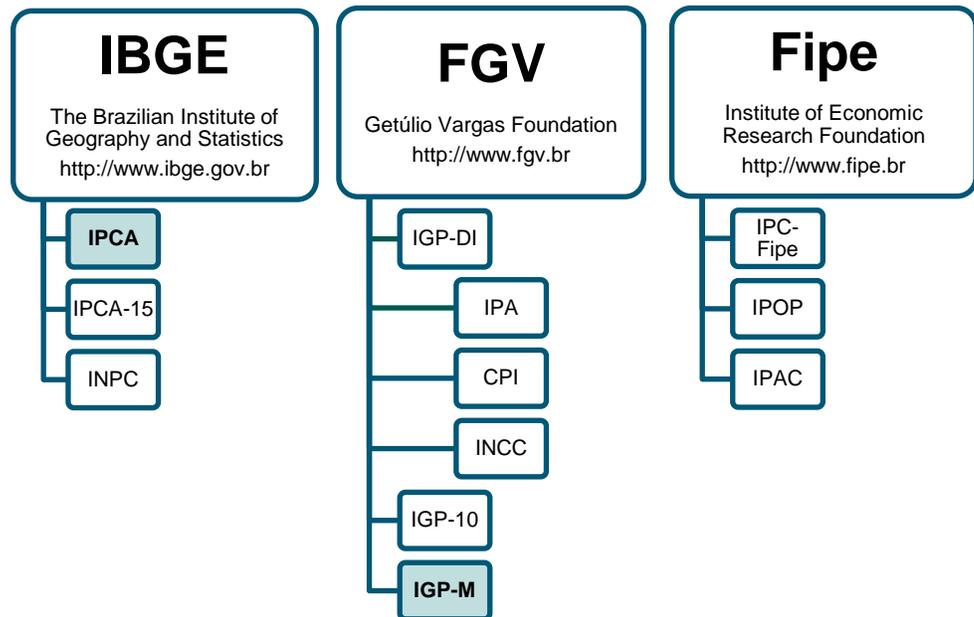
Inflation in Brazil

Inflation can be defined as the rate of change in the purchasing power of a currency unit over time. Economists distinguish between nominal prices (transaction prices, without inflation adjustment) and real prices (transaction prices adjusted by inflation). The change in purchasing power is a measure of monetary inflation. In many countries, the price levels of standard baskets of goods are calculated and maintained by government agencies.

Organizations in Brazil have built several price indices over time to address different inflation measurement needs. The key differences between the indices are the type of products included in the baskets, the population evaluated in the surveys, the price collection period, and the organization in charge of the calculation. It is not surprising that there are so many inflation indices, as inflation has long been a major concern in Brazil; the country faced hyperinflation in the 1980s and early 1990s.

Exhibit 1: Brazilian Price Indices

Faced with accelerated hyperinflation, markets needed to have an index released on the last day of the month in order to fix contracts relating to financial transactions and balance sheets.



Source: S&P Dow Jones Indices LLC, Instituto Brasileiro de Geografia e Estatística (IBGE), Fundação Getúlio Vargas (FGV), and Fundação Instituto de Pesquisas Econômicas (Fipe). Chart is provided for illustrative purposes.

The indices most relevant to our study are the General Market Price Index (IGP-M) and the National Index of Consumer Prices (IPCA) sovereign, as inflation-linked bonds use them as underlying reference price indicators. The Banco Central Do Brasil (BCB) notes that the General Market Price Domestic Availability Index (IGP-DI) represented the country’s official inflation measure for decades.¹ However, faced with accelerated hyperinflation, markets needed to have an index released on the last day of the month in order to fix contracts relating to financial transactions and balance sheets; thus, the IGP-M was created.²

The IGP-M is built with the following components and weights: 60% Wholesale Price Index (IPA); 30% Consumer Price Index (IPC); and 10% National Construction Cost Index (INCC).³ The index is calculated from the 20th day of the month to the 19th day of the following month in order to deliver the results by the last day of the month. The IGP-M is used to correct all the rental contracts and also is used as a reference for NTN-C inflation-linked bonds.⁴

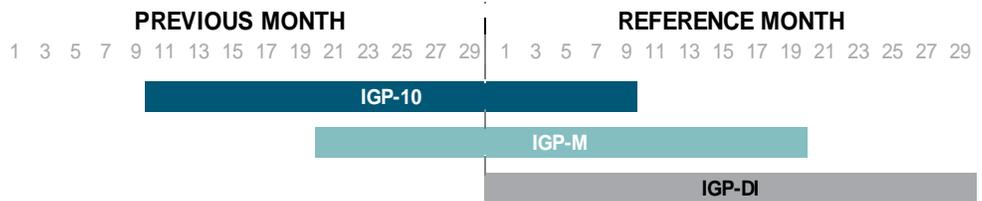
¹ “Price Indices in Brazil, Frequently Asked Questions Series,” BCB, March 2016.

² “Resolução nº 2.615,” BCB, June 1999.

³ “General Price Indexes,” Instituto Brasileiro de Economia (IBRE).

⁴ “Relatório de Inflação,” BCB, Page 83, June 1999.

Exhibit 2: Periods Covered

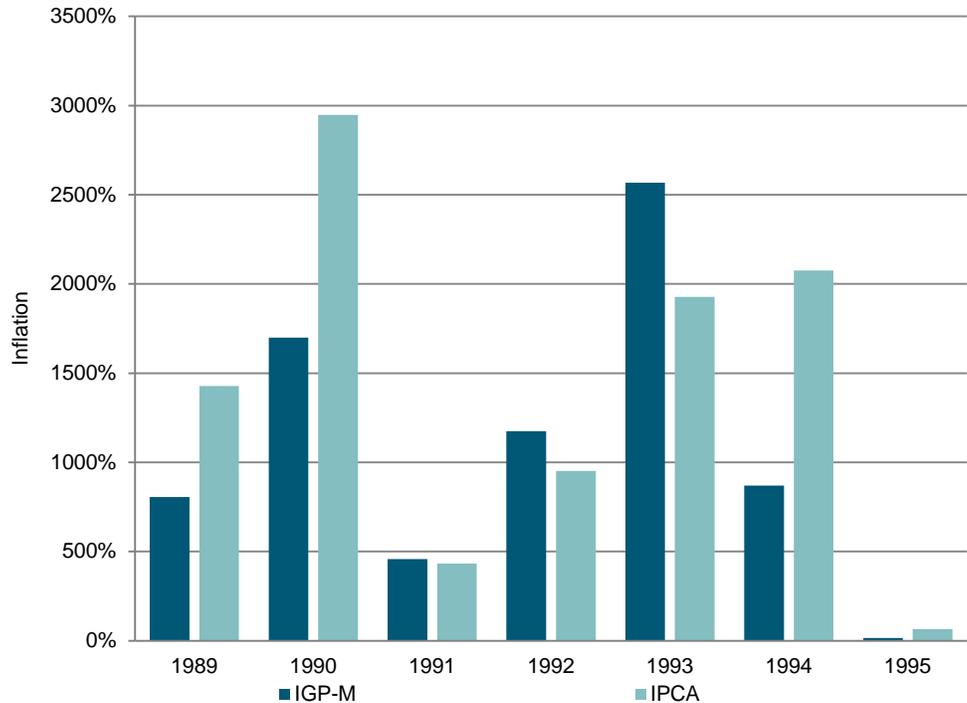


Source: FGV and IBRE. Chart is provided for illustrative purposes.

The IPCA is the official inflation index of Brazil.

The IPCA is the official inflation index of Brazil. The index was chosen by the National Monetary Council (CMN),⁵ the most important institution of the Brazilian financial system, in June 1999 to establish goals related to changes in price.⁶ The IPCA’s objective is to measure monthly variation in the average cost of living of households with incomes between 1 and 40 times the minimum wage in 11 urban centers across Brazil. The measuring period runs from the 1st to the 30th of each month. The prices used are collected from commercial establishments, service providers, homes, and public service concessions. This index is used as a reference for Brazilian Inflation-Linked Bonds (NTN-Bs).

Exhibit 3: Year-Over-Year Inflation



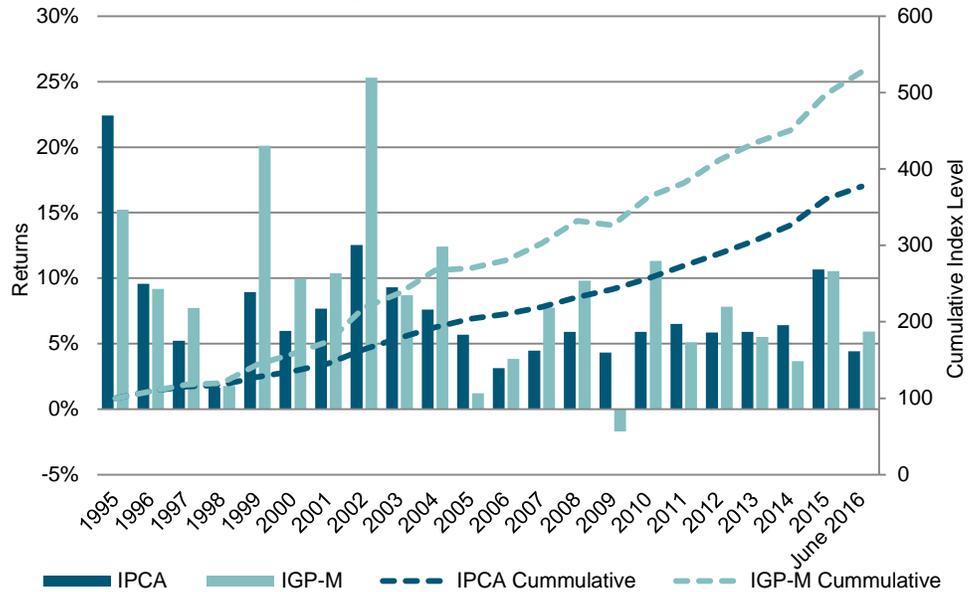
Source: FGV and IBRE. Data from January 1989 to December 1995. Chart is provided for illustrative purposes.

⁵ The BCB is part of the CMN with the Ministers of Finance and Planning.

⁶ <http://www.bcb.gov.br/htms/relinf/port/1999/06/ri199906P.pdf>

In this context of hyperinflation, Brazil was forced to implement a series of measures known as "Plano Real," which resulted in the replacement of the cruzeiro by the real in 1994.⁷

Exhibit 4: Cumulative Changes and Year-Over-Year Inflation

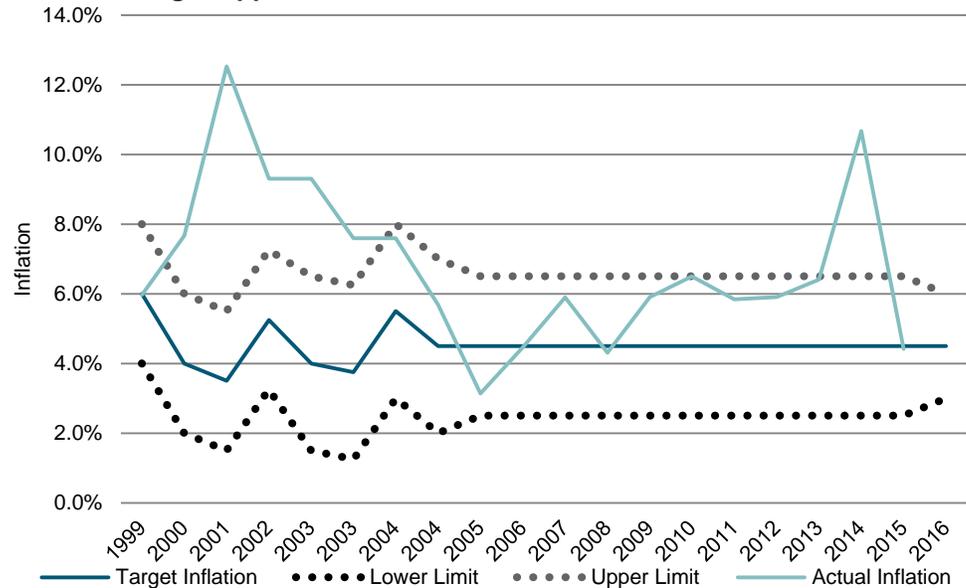


Source: IBGE and FGV. Data from January 1995 to June 2016. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

In 1999, a new inflation-targeting regime was implemented.

In 1999, a new inflation-targeting regime was implemented; Exhibit 5 shows target and actual inflation in Brazil since that date.

Exhibit 5: Target Upper and Lower Inflation Limits and Actual Inflation



Source: [BCB](#). Data from January 1999 to June 2016. Chart is provided for illustrative purposes.

⁷ "Evolução do Sistema Financeiro Nacional," BCB.

LINKERS IN BRAZIL DOMESTIC FEDERAL PUBLIC DEBT

There are four main domestic public securities representing the domestic federal public debt (DFPD).

- Brazilian LTNs: Short-term, zero-coupon bonds with fixed principal.
- Brazilian LFTs: Mid-term, zero-coupon bonds with floating principal linked to Selic.
- Brazilian Fixed Coupon Series (NTN-F): Mid- to long-term bonds that pay semi-annual, compound-interest coupons.
- Brazilian Inflation-Linked Bonds (NTN-Bs and NTN-Cs): Mid- to long-term securities that pay semi-annual coupons.

Buy-and-hold strategies in the market result in shrinkage of liquidity.

“Notas do Tesouro Nacional” B and C series (NTN-Bs and NTN-Cs) are inflation-linked securities that pay semiannual coupons and have one principal payment on the date of maturity. Cash flow amounts (principal and interest coupons) are updated from the reference date according to the security’s benchmark index (the IPCA for NTN-Bs and the IGP-M for NTN-Cs). It is important to note that NTN-C is no longer part of the Brazilian Treasury’s financing strategy. At maturity, these bonds pay BRL 1,000, adjusted according to the index from the reference to the redemption date.⁸

NTN-B bonds linked to IPCA inflation were first issued in 2003, replacing the older NTN-C bonds, which were linked to IGP-M inflation. Bonds are issued with maturities of 3, 5, 10, 20, 30, and 40 years. These maturities are split into two groups: short and medium term (3-, 5-, and 10-year bonds) and long term, which includes all remaining bonds.⁹

LIQUIDITY

S&P/BM&F Inflation-Linked NTN-B Index

Liquidity characterizes the efficiency of trading securities with little or no price impact.¹⁰ Institutional investors, such as insurance companies and pension funds, often utilize buy-and-hold strategies that align with their investment philosophy and undertake portfolio immunization—a type of liability-driven investment strategy in which fixed income securities are used with the purpose of covering future liabilities. One common approach to minimize interest-rate risk is to adjust asset durations based on forecast duration of liabilities. However, buy-and-hold strategies can have an unintended consequence of reducing market liquidity.

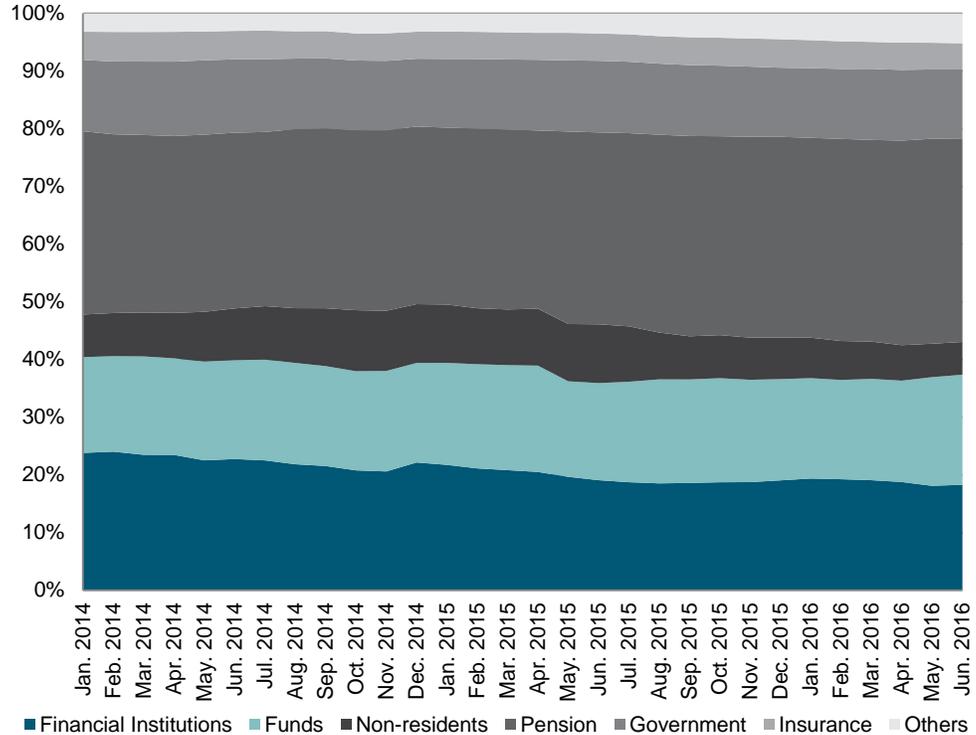
⁸ Tapajos Tavares, Marcia Fernandez, Ronnie Gonzaga Tavares, “Part III Chapter 2: Pricing federal public securities,” [National Treasury, Ministry of Finance](#).

⁹ “[Domestic Public Bonds](#),” Secretaria do Tesouro Nacional—Ministerio da Fazenda.

¹⁰ Li, Qing, Maria Sanchez, “[Exploring Liquidity and Dividends in Peru](#),” S&P Dow Jones Indices, May 2016.

According to Brazilian Ministry of Finance data, 39.84% of NTN-B bonds in Brazil were held by pension funds and insurance companies as of June 2016, possibly contributing to the liquidity issue.¹¹

Exhibit 6: NTN-B Holders



For replicability purposes, the most suitable approximation of liquidity is traded volume.

Source: [Tesouro Fazenda do Brazil](#). Data from January 2014 to June 2016. Chart is provided for illustrative purposes.

For fixed income securities, traditional measures to account for liquidity include days traded (absolute or as a percentage) and average traded volume over a specific period. For replicability purposes, the more suitable approximation is the second option. This is due to the fact that considering just the frequency or days traded can potentially miscategorize securities as being liquid and trading daily, when in reality they only trade relatively insignificant amounts. There are other factors that could favor liquidity, such as greater outstanding amount or the dynamism of the primary market. We explore those topics in the following sections.

Reviewing the Offerings—Primary Market

The Brazilian National Treasury issues a range of instruments, including zero coupon bills (LTNs); 10% coupon-bearing, fixed-rate bonds (NTN-Fs); inflation-linked bonds (NTN-Bs); and floating-rate bonds (LFTs).

The Brazilian National Treasury provides guidance on issuance for the calendar year based on annual borrowing requirements of the central

¹¹ “[Monthly Debt Report](#),” Secretaria do Tesouro Nacional—Ministerio da Fazenda, June 2016.

government. Target ranges for the total amount of debt are provided for the distribution of debt among the various instrument types, and the benchmark tenors and maturity dates are announced.

Auctions on NTN-B bonds take place every other Tuesday for short- and medium-term bonds and monthly for long-term bonds. The auctions follow a single-price or uniform-price mechanism, in which participants submit bids on the offered instruments, and the national treasury has the flexibility to decide the cutoff price for each instrument offered and so determine the composition of the issuance.

For the 2016 calendar year, the Brazilian National Treasury expects to have debt outstanding between BRL 3.1 trillion and BRL 3.3 trillion, with 29%-33% of the debt outstanding in inflation-linked bonds (including outstanding NTN-C). In terms of an issuance plan, the short- and medium-term benchmarks for the NTN-Bs are expected to be the 5- and 10-year bonds with maturity dates of May 15, 2021, and Aug. 15, 2026. The long-term benchmarks are expected to be the 20- and 40-year bonds with maturity dates of May 15, 2035, and May 15, 2055.¹²

Even with maturities, the trend in the total outstanding amount is generally increasing.

MATURITY DATE	OFFERED QUANTITY	ACCEPTED QUANTITY (PUBLIC)	QUANTITY TO CENTRAL BANK
May 15, 2021	19,350,042	13,217,050	4,430,000
Aug. 15, 2026	17,149,958	1,900,737	4,430,000
May 15, 2035	3,317,179	1,383,754	0
May 15, 2055	3,272,821	1,171,577	0

Source: Tesouro Fazenda of Brazil. Data as of Aug. 4, 2016. Table is provided for illustrative purposes.

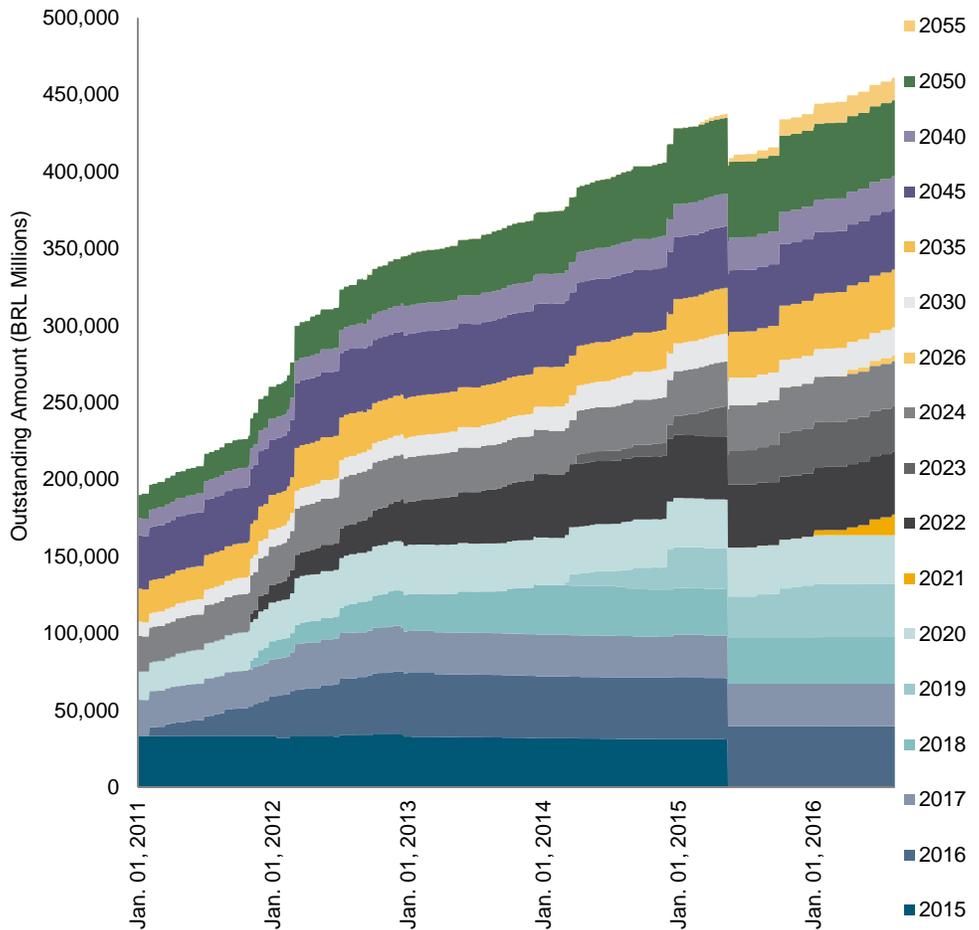
In addition to issuance auctions, the national treasury also conducts buy-back auctions to affect liquidity and manage its debt profile.

Outstanding Amount

Even with maturities, the trend in the total outstanding amount is generally increasing. Most on-the-run securities shown in yellow in Exhibit 8 were issued within the two-year period ending June 2016, with the exception of the bond maturing in 2035, which was issued in 2006. These statements are reflected by the lower outstanding amounts for the bonds issued most recently.

¹² “[Annual Borrowing Plan](#),” Secretaria do Tesouro Nacional – Ministerio da Fazenda.

Exhibit 8: Historical Outstanding Amount for NTN-B Bonds



Source: Thomson Reuters, BCB, and S&P Dow Jones Indices LLC. Data from Jan. 1, 2011, to June 30, 2016. Chart is provided for illustrative purposes.

Does having a large outstanding amount or being an on-the-run bond really lead to greater liquidity? Not necessarily.

Quantity Trade

Having a large outstanding amount or being an on-the-run bond does not necessarily lead to greater liquidity, according to our analysis. The on-the-run bond maturing in 2035 in Exhibit 9 is an example of this. This security is in the current issuance calendar of the Brazilian National Treasury and has one of the greatest outstanding amounts. However, it clearly has a decreasing trend in liquidity as measured by the quarterly average of traded titles (see Exhibit 9).

Exhibit 9: Outstanding Amount and Quarterly Historical Trading Average for Current NTN-B Bonds

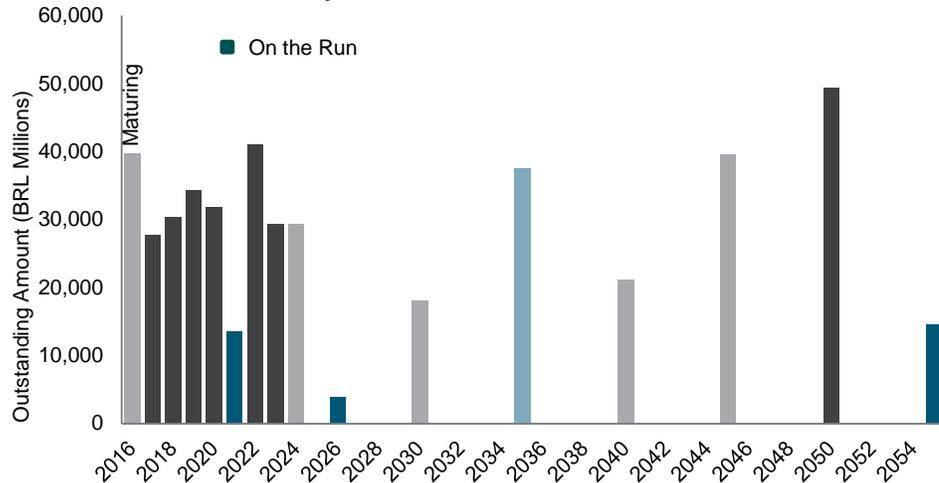
MATURITY	ISIN	OUTSTANDING AMOUNT	QUARTERLY HISTORICAL AVERAGE SINCE JANUARY 2014	
2017	BRSTNCNTB2W6	27,613		
2018	BRSTNCNTB3X2	30,365		
2019	BRSTNCNTB4N1	34,339		
2020	BRSTNCNTB3A0	31,786		
ON THE RUN	2021	BRSTNCNTB4T8	13,446	
	2022	BRSTNCNTB3Y0	41,023	
	2023	BRSTNCNTB4O9	29,361	
	2024	BRSTNCNTB096	29,295	
ON THE RUN	2026	BRSTNCNTB4U6	3,825	
	2030	BRSTNCNTB3B8	18,092	
ON THE RUN	2035	BRSTNCNTB007	37,559	
	2040	BRSTNCNTB3C6	21,161	
	2045	BRSTNCNTB0A6	39,562	
	2050	BRSTNCNTB3D4	49,309	
ON THE RUN	2055	BRSTNCNTB4Q4	14,560	

Source: Thomson Reuters, BCB, and S&P Dow Jones Indices LLC. Data as of June 30, 2016. Chart is provided for illustrative purposes.

Given that the previous conditions are not enough to ensure liquidity, it is important that other selection criteria are considered.

In order to arrive at an alternative proposal, we first look at the NTN-B maturity profile. Exhibit 10 shows on-the-run bonds in teal, and it includes in shades of gray the bonds to be considered in the August 2016 [S&P/BM&F Inflation-Linked NTN-B Index](#) selection.

Exhibit 10: NTN-B Maturity Profile



Source: BCB. Data as of June 30, 2016. Chart is provided for illustrative purposes.

In order to achieve the goal of replicability, it is necessary to provide exposure to the most liquid securities.

As we saw in the previous section, an on-the-run bond or a large outstanding amount is not enough to ensure a good liquidity level as measured by trading volume. Therefore, in order to achieve the goal of replicability, it is necessary to provide exposure to the most liquid securities. We try to achieve this by using trading volume as a screening rule as well as a weighting method.

S&P/BM&F Inflation-Linked NTN-B Index

The S&P/BM&F Inflation-Linked NTN-B Index is designed to track the performance of the most liquid NTN-B bonds, using a liquidity ratio for screening as well as a combined absolute trading volume and market-cap weighting method.

The liquidity ratio is defined as the average trading volume for the past six months divided by the par amount of the instrument. Data on trading volume is obtained from the BCB. The history and turnover analysis of bonds in the index (additions and deletions) were used to define a limit that, at the time of a rebalance, includes or excludes the instruments. Additionally, to prevent turnover, the index is rebalanced on a quarterly basis, and it includes a threshold for removing bonds already in the index.

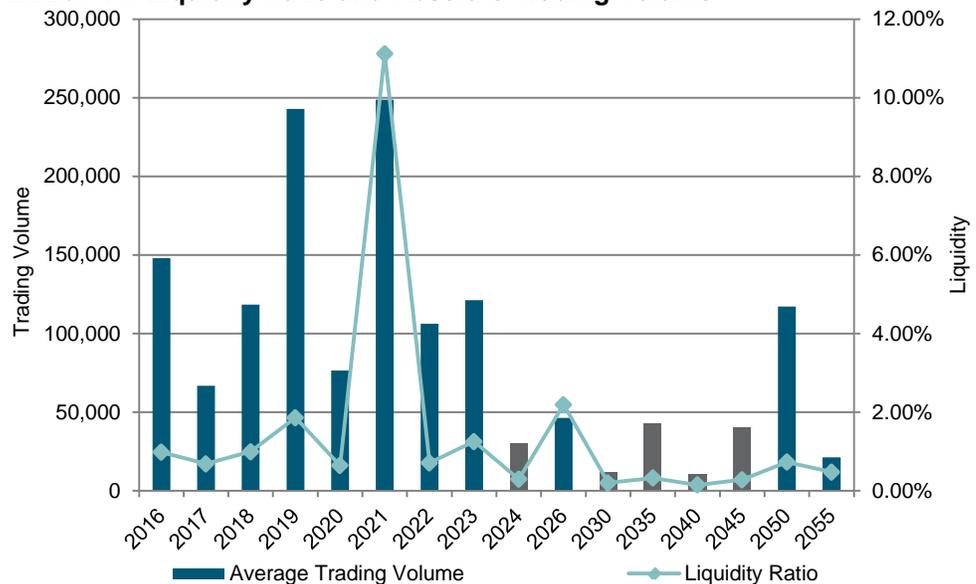
Taking a relative view of trading volume helps to determine how much of each particular issue is being traded, but comparing with other bonds can

Taking a relative view of trading volume helps to determine how much is being traded of each particular issue, but comparing with other bonds can be misleading.

be misleading, since the par amounts of the bonds are not the same. A new issuance usually has a smaller par amount than an on-the-run issuance. Also, new bonds tend to trade more than old bonds, which tend to be held rather than traded. It is therefore useful to compare absolute trading volumes, because buying USD 10 million of one issuance is equivalent to buying USD 10 million of any other, in terms of the money spent. As previously mentioned, the index measures the absolute trading volume in the weights, with a mix of market cap (which determines two-thirds of the weight) and trading volume (which determines one-third of the weight).

Exhibit 11 shows the liquidity ratio for the bonds and their absolute trading volume; the bonds shaded in gray do not comply with the liquidity criteria to be included in the index.

Exhibit 11: Liquidity Ratio and Absolute Trading Volume



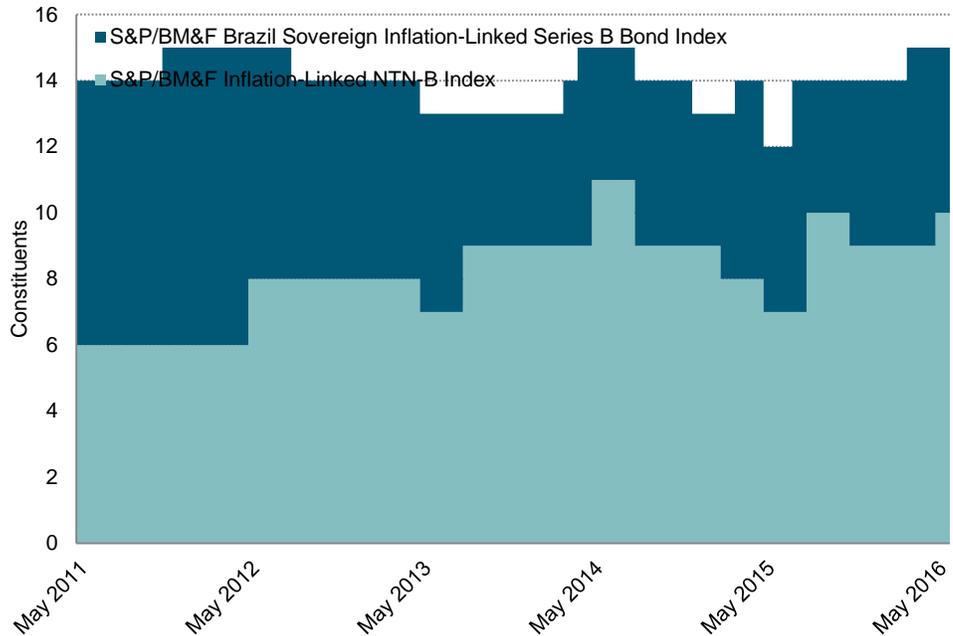
Source: Thomson Reuters, BCB, and S&P Dow Jones Indices LLC. Data as of June 30, 2016. Chart is provided for illustrative purposes. Bars shaded gray do not comply with liquidity criteria of the index.

We can see that short-term bonds are traded more than the long-term bonds, and we also see that the 2021 maturity bond has a high liquidity ratio, because it was issued in January 2016 with a small par amount and had a relatively high trading volume. This also occurred with the 2055 maturity bond, but in the one-year period ending June 2016, its liquidity ratio dropped from nearly 2% to approximately 0.50%, due to increased issuance and lower trading volume.

These two measures help with replicating the index, and having bonds with higher liquidity makes it easier to incorporate them into the market with minimal disruptions in prices. Furthermore, instead of having an index with several bonds, we can reduce the quantity and make it more flexible. Exhibit 12 shows the number of constituents in the [S&P/BM&F Inflation-Linked NTN-B Index](#) over time compared with its benchmark, the

[S&P/BM&F Brazil Sovereign Inflation-Linked Series B Bond Index](#), which includes the full curve of the NTN-B bonds.

Exhibit 12: Number of Constituents in the S&P/BM&F Inflation-Linked NTN-B Index and its Benchmark



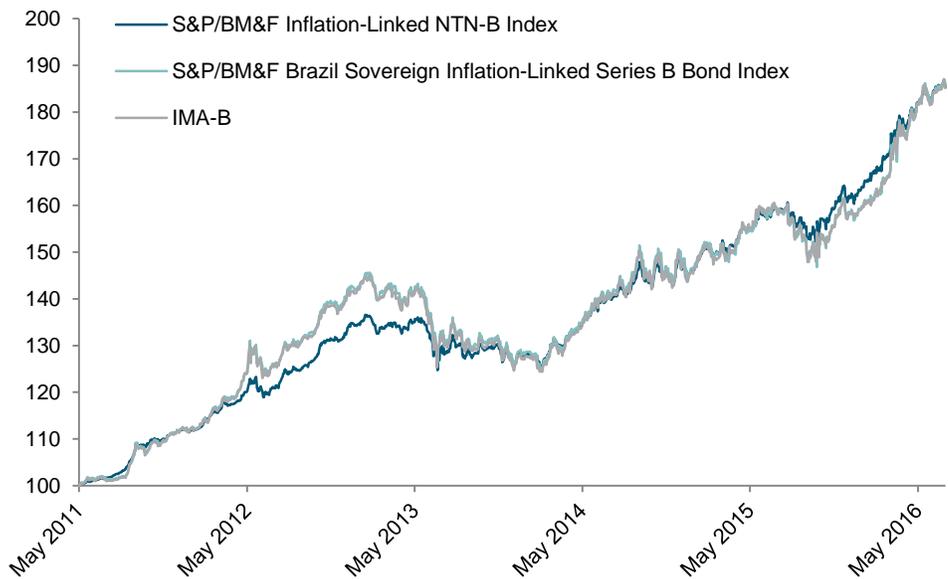
When the short-term end of the curve is the most traded and this is captured in the weights of the bonds, the index may provide a natural hedge in times of volatility.

Source: S&P Dow Jones Indices LLC. Data as of June 30, 2016. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Since the short-term end of the curve is the most traded, the index could potentially provide a natural hedge in times of volatility, as the weights in the long-term end are reduced and those in the short-term end are increased. Exhibit 13 shows the performance of the [S&P/BM&F Inflation-Linked NTN-B Index](#), S&P/BM&F Brazil Sovereign Inflation-Linked Series B Bond Index, and the Anbima Index (IMA-B).¹³ Exhibit 14 shows the annual returns of the three indices; here, we can see that the more-liquid index, S&P/BM&F Inflation-Linked NTN-B I, underperformed in 2012, but in 2013, when all three had negative returns, its returns were less negative than the other two indices by about 50%.

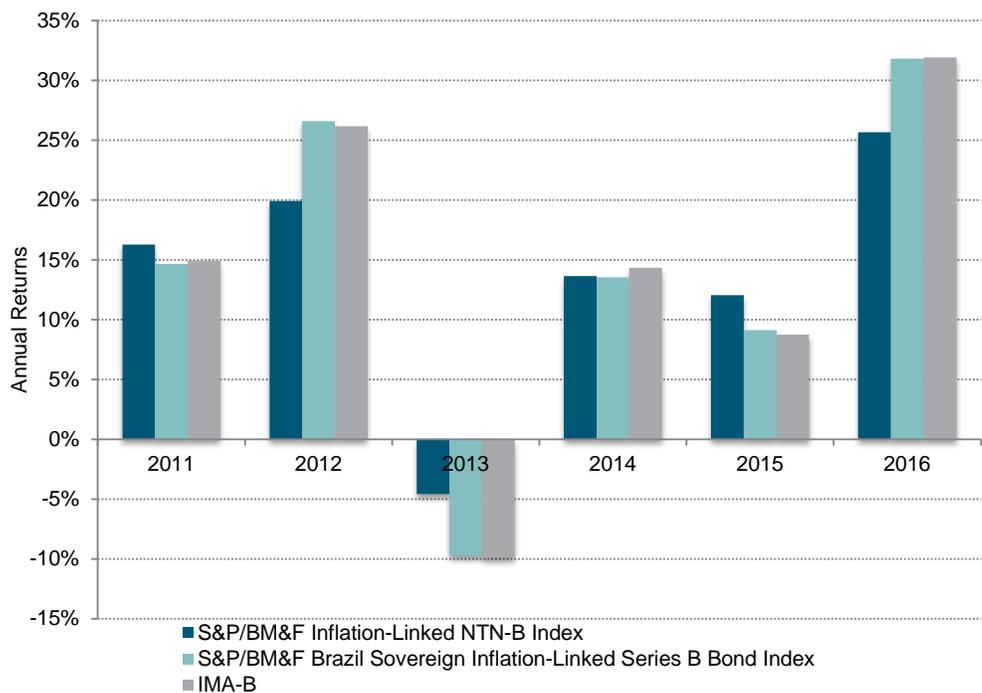
¹³ The IMA-B is an index computed by the Brazilian Financial and Capital Markets Association. The index measures NTN-B inflation-linked bonds.

Exhibit 13: Performance of Bond Indices



Source: S&P Dow Jones Indices LLC and Bloomberg. Data as of June 30, 2016. Chart is provided for illustrative purposes.

Exhibit 14: Annual Returns of Bond Indices



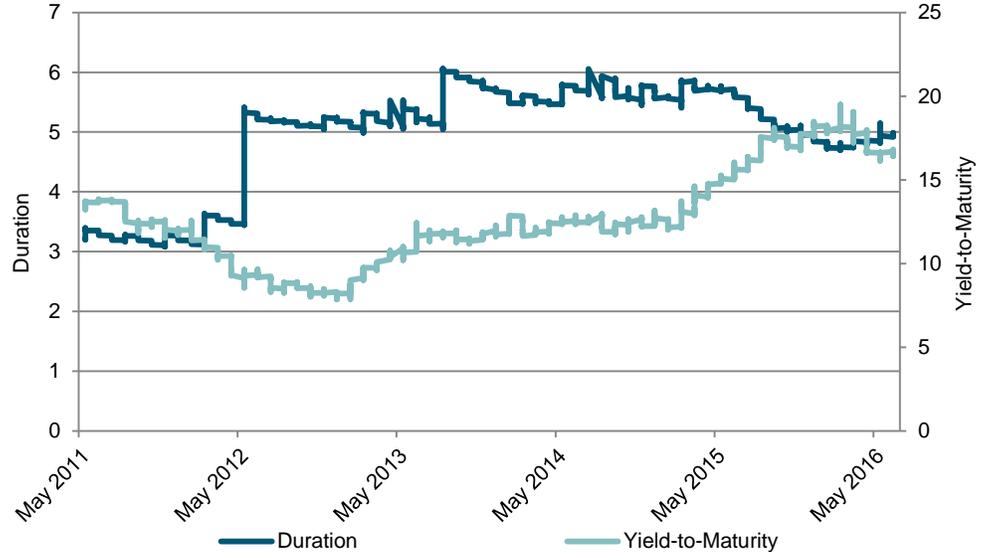
Source: S&P Dow Jones Indices LLC and Bloomberg. Data as of June 30, 2016. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Due to ETF regulations in Brazil, a vehicle must have a duration of at least two years.

Brazilian ETF regulations mandate that an ETF investment vehicle must have a duration of at least two years for tax treatment purposes. Exhibit 15 shows that the [S&P/BM&F Inflation-Linked NTN-B Index](#) has always been above this duration threshold. To ensure that any index-linked passive

vehicles are investable, the methodology states that at least 2.3 years of average duration is required.

Exhibit 15: Duration and Yield-to-Maturity of the S&P/BM&F Inflation-Linked NTN-B Index



Source: S&P Dow Jones Indices LLC and Bloomberg. Data as of June 30, 2016. Chart is provided for illustrative purposes.

We can suppose that an index weighted by liquidity that has more liquid constituents would be more stable, since returns would be less likely to deviate widely over time.

Moreover, we can suppose that an index weighted by liquidity with more liquid constituents would be more stable, since returns are less likely to deviate widely over time. Exhibit 16 shows the potential benefit of using liquidity criteria in a risk/return profile. The [S&P/BM&F Inflation-Linked NTN-B Index](#) has higher risk-adjusted returns than its peers. Also, as previously noted, having more weight in the short-term end of the curve makes the index less volatile, due to natural market movements along the curve.

Exhibit 16: Risk/Return Profiles			
DURATION	S&P/BM&F INFLATION-LINKED NTN-B INDEX	S&P/BM&F BRAZIL SOVEREIGN INFLATION-LINKED SERIES B BOND INDEX	IMA-B
RISK (%)			
3-Year	7.36	9.40	8.71
5-Year	6.54	8.63	8.24
ANNUALIZED RETURNS (%)			
3-Year	14.58	13.60	13.44
5-Year	16.23	16.43	16.40
RISK/RETURN			
3-Year	1.98	1.45	1.54
5-Year	2.48	1.9	1.99

Source: S&P Dow Jones Indices LLC. Data as of June 30, 2016. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

The main focus of this project is not necessarily performance; what we aim for is a more liquid index.

Our study aims to construct a liquid, inflation-linked bond benchmark that is replicable. To test the investability of a potential investment vehicle based on the index, we consider a hypothetical portfolio of BRL 1 billion that seeks to replicate the indices as of Aug. 31, 2016. Using the assumption that it is possible to trade 100% of the average daily traded volume over the last quarter, the expected days to trade that amount following the different index options are listed in Exhibits 17a and 17b.

RANGE	S&P/BM&F BRAZIL SOVEREIGN INFLATION-LINKED BOND INDEX	S&P/BM&F BRAZIL SOVEREIGN INFLATION-LINKED SERIES B BOND INDEX	S&P/BM&F INFLATION-LINKED NTN-B INDEX	THROWING OUT
≤1 Day	13	13	10	0
>1 Day or ≤2 Days	2	2	0	2
>2 Days or ≤3 Days	1	0	0	1
>3 Days or ≤4 Days	0	0	0	0
>4 Days or ≤5 Days	1	0	0	1
>5 Days	1	0	0	4
Total Constituents	18	15	10	8

Source: S&P Dow Jones Indices LLC. Data as of June 30, 2016. Table is provided for illustrative purposes.

INDEX NAME	MAXIMUM NUMBER OF DAYS
S&P/BM&F Brazil Sovereign Inflation-Linked Bond Index	9.70
S&P/BM&F Brazil Sovereign Inflation-Linked Series B Bond Index	1.87
S&P/BM&F Inflation-Linked NTN-B Index	0.63
Throwing Out	22.56

Source: S&P Dow Jones Indices LLC. Data as of June 30, 2016. Table is provided for illustrative purposes.

Trading a single security in several days to achieve the index weight could present potential tracking error risk for an asset manager because prices can move during those days, making the strategy more expensive.

Reviewing this information on a security level, we can see that the NTN-B bond maturing in 2026 is liquid relative to its size, and with a reduced weight, it could be traded in less than one day (see Exhibit 18). In contrast, the NTN-B bond maturing in 2035 has a large outstanding amount, which represents a greater exposure in a broad index, but given that it lacks tradability, it may not be suitable to serve as a replicable index.

Exhibit 18: Days to Trade

MATURITY YEAR	ISIN	S&P/BM&F BRAZIL SOVEREIGN INFLATION-LINKED BOND INDEX	S&P/BM&F BRAZIL SOVEREIGN INFLATION-LINKED SERIES B BOND INDEX	S&P/BM&F INFLATION-LINKED NTN-B INDEX
2016	BRSTNCNTB3F9	Maturing	Maturing	Maturing
2017	BRSTNCNTB2W6	0.30	0.32	0.42
2017	BRSTNCNTC0P3	10.03	NTN-C	NTN-C
2018	BRSTNCNTB3X2	0.18	0.19	0.28
2019	BRSTNCNTB4N1	0.09	0.10	0.19
2020	BRSTNCNTB3A0	0.28	0.31	0.41
2021	BRSTNCNTB4T8	0.04	0.04	0.12
2021	BRSTNCNTC0M0	2.40	NTN-C	NTN-C
2022	BRSTNCNTB3Y0	0.26	0.29	0.41
2023	BRSTNCNTB4O9	0.19	0.20	0.31
2024	BRSTNCNTB096	0.75	0.82	Liquidity Criteria
2026	BRSTNCNTB4U6	0.08	0.09	0.13
2030	BRSTNCNTB3B8	1.56	1.69	Liquidity Criteria
2031	BRSTNCNTC0K4	4.46	NTN-C	NTN-C
2035	BRSTNCNTB0O7	0.70	0.75	Liquidity Criteria
2040	BRSTNCNTB3C6	1.83	1.98	Liquidity Criteria
2045	BRSTNCNTB0A6	0.68	0.74	Liquidity Criteria
2050	BRSTNCNTB3D4	0.25	0.27	0.35
2055	BRSTNCNTB4Q4	0.54	0.59	0.69

Source: S&P Dow Jones Indices LLC. Data as of Aug. 31, 2016. Table is provided for illustrative purposes.

Several conditions may help liquidity simply because of the nature of the market.

Sovereign inflation-linked bonds offer one possible tool for managing inflation, but low liquidity in this market potentially poses investability concerns.

CONCLUSION

The need to hedge against inflation in Brazil has been and continues to be a key consideration of market participants. Sovereign inflation-linked bonds offer one possible tool for managing inflation, but low liquidity in this market potentially poses investability concerns. No evidence was found to support that a single condition, either outstanding par amount or primary market offering, can determine the liquidity of a bond. The inclusion of liquidity features in an index may improve its replicability. In this particular market, including liquidity features may also help to hedge during volatile times and could produce a better risk/return profile when compared with broader indices.

PERFORMANCE DISCLOSURE

The S&P/BM&F Inflation-Linked NTN-B index was launched on January 29, 2016. The S&P/BM&F Brazil Sovereign Inflation-Linked Series B Bond index was launched on September 17, 2015. All information presented prior to an index's Launch Date is hypothetical (back-tested), not actual performance. The back-test calculations are based on the same methodology that was in effect on the index Launch Date. Complete index methodology details are available at www.spdji.com.

S&P Dow Jones Indices defines various dates to assist our clients in providing transparency. The First Value Date is the first day for which there is a calculated value (either live or back-tested) for a given index. The Base Date is the date at which the Index is set at a fixed value for calculation purposes. The Launch Date designates the date upon which the values of an index are first considered live: index values provided for any date or time period prior to the index's Launch Date are considered back-tested. S&P Dow Jones Indices defines the Launch Date as the date by which the values of an index are known to have been released to the public, for example via the company's public website or its datafeed to external parties. For Dow Jones-branded indices introduced prior to May 31, 2013, the Launch Date (which prior to May 31, 2013, was termed "Date of introduction") is set at a date upon which no further changes were permitted to be made to the index methodology, but that may have been prior to the Index's public release date.

Past performance of the Index is not an indication of future results. Prospective application of the methodology used to construct the Index may not result in performance commensurate with the back-test returns shown. The back-test period does not necessarily correspond to the entire available history of the Index. Please refer to the methodology paper for the Index, available at www.spdji.com for more details about the index, including the manner in which it is rebalanced, the timing of such rebalancing, criteria for additions and deletions, as well as all index calculations.

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