IMA Methodology

ANBIMA Market Index

April/2019

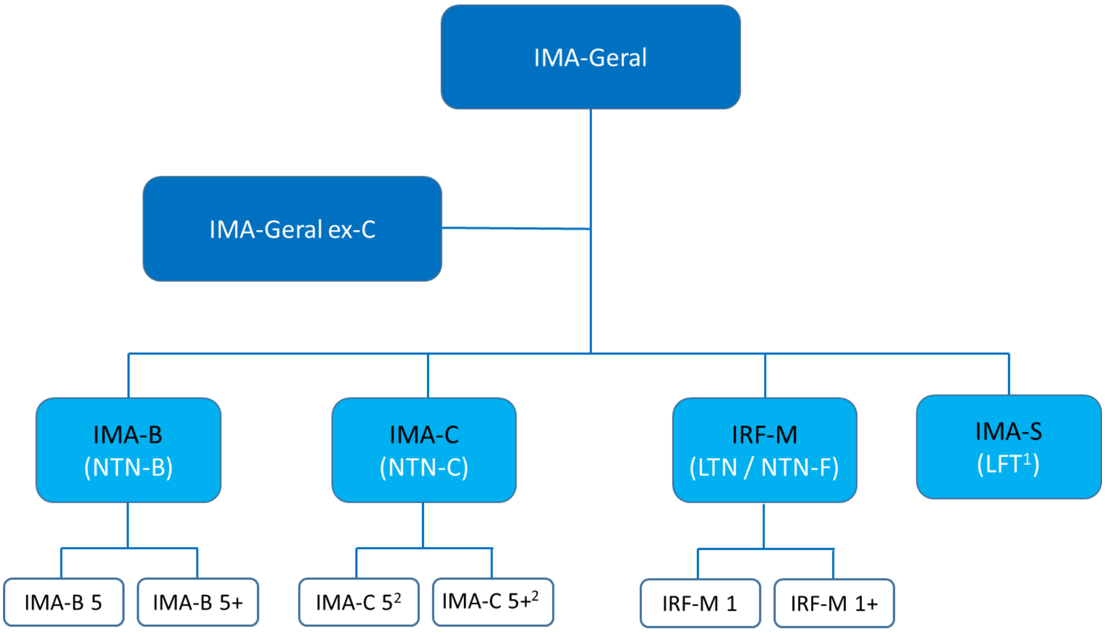
ANBIMA

Summary

1. What is IMA – ANBIMA Market Index

IMA – ANBIMA Market Index ("*Índice de Mercado* ANBIMA") is a family of indexes that represent the evolution, at market prices, of the portfolio of outstanding government bonds; the IMA indexes play the role of Benchmarks for that segment.

Aiming at fulfilling the needs of a diverse range of investors and their respective portfolios, the IMA is currently segmented into four sub-indexes, according to the type of interest payments: fixed rate, IPCA linked, IGP-M linked and floaters (linked to the Selic rate). Apart from the IGP-M linked and floating-rate bonds' theoretical portfolios, all remaining sub-indexes are further partitioned based on their components' terms to maturity. Additionally, since the STN (Brazilian National Treasury) explicitly manifested its intention of ending issuance of IGP-M linked bonds (NTN-C), and due to the low liquidity of this segment, it has been decided to build an aggregate index, along the lines of the IMA-Geral but excluding the IGP-M linked bonds (NTN-C). This is the IMA-Geral ex-C index. The following figure reports the actual breakdown of the IMA family:



Notes: 1: It does not include LFT-A and LFT-B bonds. **2:** Until 03/01/2011, the IMA-C had two sub-indexes: the IMA-C 5, which included NTN-C bonds due in less than 5 years, and the IMA-C 5+, contemplating NTN-C bonds whose term is greater than or equal to 5 years. From this date on, due to the minute number of maturities and to STN explicit intention of no longer issuing IGP-M linked bonds (NTN-C), the Association's Board of Directors has approved the cessation of these two sub-indices, as analyzed and suggested by the members of both Benchmarks Subcommittee and Pricing Committee.

2. Theoretical portfolios

In order to preserve the index representativeness, the composition of the theoretical portfolios are reviewed monthly, capturing changes to the bonds' outstanding amounts.

a) Bonds Eligibility Criteria

Within all government bonds priced by ANBIMA, are not eligible only:

- Bonds that come due in less than one month - ie. whose maturity would take place during the theoretical portfolio validity period;
- Bonds that were placed only through non-competitive issuances, without public tenders;
- Bonds which had a single public offer placement[1];
- New maturities placed in the market in the last two business days before the theoretical portfolio rebalancing date.

Breaking down by maturity, the IRF-M index is segregated into the IRF-M 1 and the IRF-M 1+. The IMA-B is segmented into the IMA-B 5 and the IMA-B 5+. The following criteria are adopted:

- The "5+" portfolio consist of bonds maturing in five years or more. The "5" portfolio, on the other hand, comprehend bonds maturing in less than five years and those in the migration process.
- The "1+" portfolio includes bonds maturing in one or more years. In turn, the "1" portfolio holds bonds maturing in less than one year.

IMA-B

Tenors	60 months	61 months	62 months	63 months	64 months
IMA-B 5	100%	75%	50%	25%	0%
IMA-B 5+	0%	25%	50%	75%	100%

Until November, 2016, bonds reaching the term-limit for their participation into IMA-B 5+ portfolio were fully redeemed and reinvested into the IMA-B 5 portfolio at the theoretical portfolio rebalancing date. Since December of the same year, the migration of such assets to the latter sub-index from the former takes place in four successive steps. The migration process of the asset closest to the term-limit starts three months before it becomes ineligible to the IMA-B 5+. Then, on every

[1] New maturities placed after May 2010 will be immediately included into the corresponding indexes. However, if no further placement takes place within the following three months, these bonds will be removed from the index until the STN makes a second placement, through a public offer.

rebalancing date, 25% of the bond's total outstanding amount is migrated to the IMA-B 5 from the IMA-B 5+, in incremental steps.

b) Total Outstanding Amount

The relevant outstanding amounts are those registered three business days prior to the theoretical portfolio rebalancing date.

Such amounts change only through STN definitive purchase, sell or exchange operations. Although bonds sold exclusively through non-competitive issuances are not eligible to be part of IMA's theoretical portfolio, such amounts are added to the bonds outstanding used for calculation. Moreover, the amounts of eligible maturities placed through STN's "*Tesouro Direto*" program are also included into the calculations.

c) Theoretical Portfolio Validity Period and Rebalancing

The theoretical portfolio of each IMA sub-index is held constant throughout its validity period. Regarding IRF-M, IMA-C and IMA-S, the theoretical portfolio validity ranges from the 2^{nd} business day of the month through the first business day of the following month. In turn, the theoretical portfolio cycle for the IMA-B begins on the 16^{th} and ends on the 15^{th} of the subsequent month. Whenever such dates are non-business days, the following business day is considered instead.

Both IMA-Geral and IMA-Geral ex-C are rebalanced whenever any sub-indexes are, which implies a shorter portfolio cycle (roughly, a fortnight).

Portfolio rebalancing occurs on the last validity day of the current theoretical portfolio, after computation of the index value.

<table>
<tr><th>Index</th><th>Validity Period</th><th>Rebalancing</th></tr>
<tr><td>IRF-M</td><td rowspan="7">From second business day of the month until first business day of the next month.</td><td rowspan="7">After calculation of first business day of the month.</td></tr>
<tr><td>IRF-M 1</td></tr>
<tr><td>IRF-M 1+</td></tr>
<tr><td>IMA-C</td></tr>
<tr><td>IMA-C 5</td></tr>
<tr><td>IMA-C 5+</td></tr>
<tr><td>IMA-S</td></tr>
<tr><td>IMA-B</td><td rowspan="3">From first business day after the 15th, until day 15 of next month.</td><td rowspan="3">After calculation of the 15th day of the month.</td></tr>
<tr><td>IMA-B 5</td></tr>
<tr><td>IMA-B 5+</td></tr>
<tr><td>IMA-Geral ex-C</td><td colspan="2">Components' weights adjusted according to changes in the sub-indexes, roughly a fortnight.</td></tr>
<tr><td>IMA-Geral</td><td colspan="2">Components' weights adjusted according to changes in the sub-indexes, roughly a fortnight.</td></tr>
</table>

3. Index Calculation

The chain-linking method applied in all sub-indexes of the IMA family is the Laspeyres approach (ie. components' prices are weighted by their base-period theoretical amounts). Therefore, changes to the theoretical portfolio's composition by themselves do not affect index returns.

In order to obtain each IMA sub-index, the theoretical amount of each bond (on the base period) is multiplied by its price (on the reference date), supplying each bond's number of points within the full index number. The sum of all component's number of points corresponds to the index number level. It is important to notice index calculation takes into account both interest coupons and eventual redemptions that occurs on the reference date.

The index is calculated according to the following formula[2]:

$$I_t = \sum_{j=1}^{k} Q_v^j \times \left(P_t^j + C_t^j\right) \tag{1}$$

Where:

k	is the index number of components
I_t	is the index number at reference date t
Q_v^j	is maturity j valid theoretical amount
P_t^j	is maturity j ex-interest price at the reference date t
C_t^j	is maturity j interests paid at the reference date t

On the rebalancing date, the following procedure is adopted:

1. Using the eligible bonds market quantities $\left(Q_m^j\right)$, described at item 2.b, an auxiliary index is calculated:

[2] Prior to May 2017, daily returns of the broad indexes were computed through a weighted average of the sub-indexes' daily variations.

2 $$I_t^a = \sum_{j=1}^{k} Q_m^j \times P_t^j$$

2. Then, the new theoretical amount of each eligible bond $\left(Q_{nv}^j\right)$[3] is adjusted using the values obtained in step 1:

3 $$Q_{nv}^j = Q_m^j \times \left(\frac{I_t}{I_t^a}\right)$$

The IMA-Geral and IMA-Geral ex-C are calculated in the same fashion as the other sub-indexes (formula 1). On first business day, only fixed rate, IGP-M linked and floaters bonds are adjusted. The IPCA linked bonds adjustment occurs at IMA-B´s rebalancing date.

4. Dataset

a) Quantities

Through an agreement settled with ANBIMA, STN is in charge of sending, daily, the market quantities for all maturities participating in the different portfolios.

In the event of data unavailability, ANBIMA will be responsible for updating market quantities, making use of issuance information (public offers) and redemption, disclosed in due time by SELIC (*Sistema Especial de Liquidação e de Custódia*) and STN.

b) Prices

The prices used for valuing the theoretical portfolios components are calculated daily by ANBIMA, based on surveys with a representative sample of financial institutions active on the government bonds' secondary market. This sample includes banks, asset managers and brokers. The survey aims at capturing the fair price of each bond, that is to say, the value at which a given institution would do business with that specific maturity, regardless if any trade actually took place during the day or not.

In order to eliminate spurious prices and outliers, several statistical criteria and filters are applied. For a thorough description of the statistical filtering process, refer to ANBIMA's

[3] Therefore we have $\sum_{k=1}^{j} \boldsymbol{Q_{nv}^j}\ \boldsymbol{x}\left(\boldsymbol{P_t^j} + \boldsymbol{C_t^j}\right) = \boldsymbol{I_t}$, preserving index continuity in spite of the theoretical portfolio rebalancing and maintaining each bond's relative values vis-à-vis the aggregated market portfolio (total value of eligible bonds).

Code of Regulation and Best Practices on the Trading of Financial Instruments, available at the Association's website.

At the end of this process, for each maturity, an indicative average interest rate is determined. In cases, where it is not possible to calculate such rates for a maturity that is part of the index theoretical portfolios, the last available rate will be used and a new unitary price for the reference date will be calculated.

5. Events that can interfere at the index daily calculation

Published indexes will not undergo any type of recalculation whatsoever.

Any events concerning data compilation, calculation and indexes disclosure will be duly publicized in the Association's websites.

6. Index cessation

Index cessation or interruption will be evaluated by the Benchmarks Subcommittee and approved by the Pricing Committee.

ANBIMA announces index cessation decisions through its communication channels.

7. Index dissemination

a) Preview and Monthly Theoretical Portfolios

The list of components and quantities that will be taken into account for each theoretical portfolio, during the respective validity period, is disclosed two business days in advance to the rebalancing date, in the morning. On the rebalancing date, the weights of each component for the next validity period are disclosed.

b) Daily Market Amounts

A list containing statistics regarding government bonds market stocks and their changes is disclosed daily, during the morning (one business day lag).

c) Daily Results

Indexes results and their statistics are disclosed daily, after the determination of their components' secondary market prices, which occurs, normally, after 19hs (BRT).

8. Disclaimer / Liability Exemption

IMA's disclosure has a merely informative objective and its use by economic agents is optional. ANBIMA does not take responsibility for eventual damages or losses that might arise to users employing its indexes with any purpose and, in this case, the latter assume entire and exclusive responsibility.

9. Final comments / Final considerations

Cases not provided for in the methodology will be evaluated by the competent organisms.

Any methodological modification will be disclosed 120 days in advance, except for fortuitous cases that demand timely actions.

On occasions, where methodological modifications seeking the index preservation demand prompt actions, the adopted procedures can be evaluated and approved by restricted groups of members from the responsible organisms. In these cases, the evaluation must be undertaken by at least five Benchmarks Subcommittee members and three Pricing Committee members (including, preferably, the organism's President and Vice-President).

All decisions are disclosed through ANBIMA's communication channels.

IMA Methodology

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