

SECONDARY MARKET

A - DEBENTURES PRICING METHODOLOGY

1 - Introduction

The work developed by ANDIMA in the pricing of public bonds led the Assets Pricing Committee of the Association to demand studies aiming at publishing information for private securities as well. The demand that the portfolios holders /managers must mark to market the bonds (publics and private) in their portfolios exposed the existing information gap on prices of the private papers.

Therefore, a work group was set up, formed by representatives from institutions quite active in the private debt market, which suggested to ANDIMA to take advantage of the experience with the development of the National Debenture System and begin the studies for such asset.

The initial challenge lied in selecting a sample of debentures to be priced from among the series registered with the SND, taking into account the significant differences between each deed. In order to that, it was sought to avoid some characteristics that could hinder obtaining of price in the market:

- Debentures with participation events and convertible debentures were not considered;
- Only debentures presenting ratings equal or higher than BBB (or equivalent classification among the rating agencies) were considered;
- Preference was given to debentures that had trades registered at the SND secondary market; and
- That had been indicated for at least three price-makers of the sample.

The result of such selection produced a sample of securities that are included in the publication of the ANDIMA Secondary Debenture Market, and which receive information from a group of participant institutions in such market. The information is received daily up to the 06:00 pm by the RTM through collection systems set up at the institutions, and the Association releases to the public the ascertained averages up to 08:00 pm.

The institutions are required to inform the purchase and sale rates, which would reflect open transactions or spreads along the day, and the indicative taxes corresponding to the rates appraised by the institution as fair trading price for each issuance, according to the individual pricing models, regardless of any trades having occurred with the bond. All the received rates are submitted to statistical screens (see methodology below). The simple averages are select with the information not eliminated by these criteria.

Since the debenture pricing project that releases information on referential rates to the secondary market is consolidated as from May 2004, and in view of the diagnosis on the difficulties found in the price ascertaining process (UNIT PRICE) in such segment, mostly related to the small liquidity of those securities and the specificity of many deeds thereof, ANDIMA, aiming at to accomplish its objective of stimulating the primary and secondary fixed income bond markets, has created the Debentures CONFERE (a Electronic Calculator), in June of 2005.

The calculation methodology of the tool available for RTM users was set up based on studies supported by the group of institutions composing the ANDIMA sample for ascertainment of rates, and submitted to approval of the ANDIMA Assets Pricing Committee. The procedure for calculation of the Unitary Prices (UNIT PRICE) at the CONFERE were replicated for its ascertainment in the Secondary Debenture Market publication, based on the ascertained Indicative Rates, with some differences described herein, aiming at more specific standardization.

Therefore, just like with the calculator, publishing of the Unit Prices respects the calculation characteristics described in the debenture issuance deeds of the ANDIMA sample and, at the same time, it incorporates the consensual market practices defined by the work group formed by the Association at the conception of the mark to market project and approved by the ANDIMA Assets Pricing Committee.

2 - Calculation Criterion for the Secondary Debentures Market Average Rates

The Inter-financial depositive Rate averages are ascertained with the information that surpasses the three statistical screens described below.

2.1) Screen 1: Box Plot

This methodology, which provides the data dispersion, constitutes a major tool for identification of outliers in a sample. In order to establish the limits, the first and third quarters must be worked with, according to the preset formulas listed below:

$$L1 = Q1 - (Q3 - Q1)$$

$$L2 = Q3 + (Q3 - Q1), \text{ where:}$$

L1 – Lower limit.

L2 – Upper limit.

Q1 – First quarter, calculated based on the median of the observations to the left of the aggregate sample median value.

Q3 – Third quarter, calculated based on the median of the observations to the right of the aggregate sample median value.

All observations outside this interval will be deleted. Use of this wide limit screen is intended to nullify information overly out of consensus and any typing mistakes that could influence calculation of the rates.

2.2) Screen 2: Deviations with regard to the Median

- Inter-financial deposits (ID) percentage remunerating securities

The first step is to calculate the difference between the rate provided by the institution and the post-screen 1 sample median for a given paper.

Inter-financial deposits = $| T_i - \Pi |$, where:

Inter-financial deposits – Result of the difference between the below- specified variables.

T_i – Rate provided by each institution.

Π – Sample median.

The second step is establishing the 5% value of the sample median regarding the bond as acceptance limit for the sent rates. This percentage was established based on the background analysis of the rates provided by the institutions included in the ANDIMA sample.

$$La = \Pi * 0.05, \text{ where:}$$

La – Di Acceptance limit.

The third and last step is to compare the D_i difference with the L_a limit, calculated in the second stage. In case the rate deviation observed with regard to the median is larger than this criterion, it shall not be used for calculation of the third screen. As a result, the rate provided by the institution is eliminated.

If $D_i > L_a$, then T_i is eliminated.

If $D_i < L_a$, then T_i goes to the third screen.

- DI remunerating securities or IGP-M added of coupon

The process is the same for the two categories above. For these groups, we established comparative ratios (C_f) and the median percentages based on the background analysis, as previously performed. The divisions were performed according to the median absolute values, distributed as follows:

Up to 5%	10% of median and C_f ratio = 0.25.
5% up to 10%	5% of median and C_f ratio = 0.45.
+ than 10%	10% of median and C_f ratio = 1.50.

where:

C_f is a fixed parameter calculated based on the background information received in the pre-operational stage of the studies, according to the indexer type and the rate median absolute value.

As before, the difference is calculated between the institution supplied rate and the sample median for each paper.

$$D_i = | T_i - \Pi |$$

The second step is to calculate L_a as the median percentage relative to each paper.

$$L_a = \Pi * 0.10$$

Then L_a and C_f are compared in order to establish which of the two parameters will be used as criterion for elimination of the institution supplied rate in the following calculation. Thus:

If $L_a < C_f$ ----- L_a is discarded.

If $L_a > C_f$ ----- C_f is discarded.

Finally, the fourth step is to compare the Inter-financial Deposits (ID) difference with the (C_f) parameters or the (L_a) limit previously ascertained. If the deviation of the institution provided rate with regard to the median is larger than the largest of these two parameters, the information is discarded. I.e.:

$D_i > L_a$ or C_f ----- T_i is discarded.

$D_i < L_a$ or C_f ----- then T_i goes to the 3rd screen.

2.3) Screen 3: t Tests

A trust interval is calculated by using the rates remaining after the screen 2 and observing the criterion of at least three observations, using the t distribution around the average, as specified below:

$$-\frac{tS}{\sqrt{n}} < \bar{X} < +\frac{tS}{\sqrt{n}}$$

where:

S – Standard deviation of the sample.

t – t statistics to be found based on the significance level (2.5%) and in the degree of freedom which depends on the size of the sample.

\bar{X} – Average of the sample.

n – number of observations (sample).

All information not included in such interval will be eliminated from the sample. Based on the remaining observations, a new average will be calculated to be published to the market. It should be reminded that if all the rates are the same in any one of the steps above, the observed value will be released. These criteria are also applied to the purchase and sale rates.

2.4) Indicative Interval:

In addition the indicative average rate ascertained after application of the statistical screens, the Association also publishes an indicative interval whose center is the average itself and the limits correspond to + / - 1 standard deviation of the information remaining after the screen 2.

3 - General aspects of the Unitary Price (UP) calculations

- The ANDIMA indicative rate will be used for UNIT PRICE calculation always based on 252 business days;
- When there is a Repricing clause, the expiration dates shall become the date of that possible event;
- In all cases, when the events (payment of interests, correction of face value, amortization and principal) fall on non-business days, the payment date will be the business day immediately subsequent;
- When the debenture issuance deed indicate commitment settlement in dates other than those of the payment events, the flows set up shall respect the date of financial settlement;
- The payment flow set up for securities remunerated in ID percentages (% ID) will use the interest expectation for the vertexes of future interests and principal payments. In such case, ANDIMA will use the Swap Referential Rates PREFIXEDxDI of Futures and Commodities Exchange (BM&F), published daily. The Association will wait up to the 8:00 pm for information from the BM&F. After that time, the Unit Price calculation of the securities in % (ID) will published only at the following day;

- For the Inter-financial deposits + Spread (Inter-financial deposits +%) remunerated securities the interest expectations for the vertexes of future interests and principal payments will not be used;
- For the securities of the sample in which no accuracy calculation criterion is defined in the issuance deeds, the UNIT PRICE follows the criteria set forth in the Text Guidelines for SND Debentures Calculation (no available in English version).
- The Unitary Prices released in the ANDIMA Secondary Debentures Market publication can be calculated through the Debentures CONFERE, provided that some criteria adopted by the Association in standardizing the UNIT PRICE calculation are respected. These are, in a few words:
 - in Unit Prices of securities remunerating Inter-financial deposits + Spread, published by ANDIMA, the interest expectations are not used. In order to find the same Unit Price at the CONFERE, it will be necessary to type the indicative rate published by the Association with four decimal positions, no rounding, and placing "zero" in the fields of interest expectations;
 - in Unit Prices calculations for securities remunerating IGP-M (General Price Indexes – Market) + Spread, published by ANDIMA, prorating is always per business day when the IGP-M ANDIMA projection is used. In order to find the same Unit Price at the CONFERE, the use the ANDIMA projection and the appropriation criterion for business days will be necessary, in addition to the indicative rate published by the Association.

3.1 UNIT PRICE for INTER-FINANCIAL DEPOSITS remunerated securities

- The face values (VNA) of the Inter-financial deposits (ID) remunerating debentures are not momentarily updated. Therefore, except for debentures with amortization of principal, the VNA will be same as the VNE (issuing nominal value);
- Interest calculation is performed according to the following formula:

$$PUPAR = VNA \times (InterestFactor)$$

$$InterestFactor = \prod \left\{ \left[\left(\frac{1 + DIRate}{100} \right)^{\frac{1}{252}} - 1 \right] \times \frac{P}{100} + 1 \right\}$$

in the case of securities remunerated in INTER-FINANCIAL DEPOSITS percentage; and

$$\text{InterestFactor} = \left\{ \prod_n^{i=1} \left[\left(1 + \frac{DIRate_i}{100} \right)^{\frac{1}{252}} \right] \right\}^x \left[\left(1 + \frac{S}{100} \right)^{\frac{du}{252}} \right]$$

in the case of securities remunerated in INTER-FINANCIAL DEPOSITS + Spread;

where:

UNIT PRICE PAR – issuance face value, discounted amortizations, if any, added by the remuneration accumulated since the last interest payment event up to the baseline date, calculated with six decimal positions, no rounding;

VNA – updated face value of debenture, calculated with six decimal positions, no rounding. It will be same as the issuance face value (VNE) if there is no amortization of principal;

Amortization – it can be a fixed percentage over the VNE or fixed value defined in the deed, calculated with six decimal positions, no rounding;

Interest Factor – INTER-FINANCIAL DEPOSITS Rate accumulated variation factor, including the percentage (P), or Spread (S), between the starting date (included) and final date (excluded) in the capitalization period of the remuneration, calculated with nine decimal positions, no rounding;

INTER-FINANCIAL DEPOSITS Rate – rate ascertained based on the operations for issuance of prefixed Interfinancial Deposits, agreed for a business day, in year percentages, 252 days base, daily calculated and published by CETIP, rounded for two decimals positions;

P – INTER-FINANCIAL DEPOSITS Rate percentage (remuneration) defined in the deed, used with two decimal positions;

S – *Spread* above the INTER-FINANCIAL DEPOSITS Rate (remuneration) defined in the deed, used with four decimal positions

du – number of business days between the last interest payment date and the baseline date.

Notes:

1) The factor resulting from the expressions (daily factors productional) $\prod \left\{ \left[\left(1 + \frac{DIRate}{100} \right)^{\frac{1}{252}} - 1 \right] x \frac{P}{100} + 1 \right\}$ and $\prod \left\{ \left[\left(1 + \frac{DIRate_i}{100} \right)^{\frac{1}{252}} \right] x \left[\left(1 + \frac{S}{100} \right)^{\frac{du}{252}} \right] \right\}$ are accounted with 16 (sixteen) decimal positions, no rounding;

2) With the daily factors accumulated, the resulting factor with 8 (eight) rounded decimal positions is considered the “INTER-FINANCIAL DEPOSITS Factor”.

- The calculation of interests payment for debentures remunerating based on INTER-FINANCIAL DEPOSITS percentage uses an interests expectation (*Exp*), base 252 business days for each event date. This rate is obtained based on the BM&F report (Referential Rates INTER-FINANCIAL DEPOSITS X PRE), at the end of the day, after closings of markets, exponentially interpolated for the respective payment dates. The expectation is used as adjustment to the accumulated spread and, for the first interests expiration appearing in the flow, the formula is as follows:

$$PaymentInterests_{i^{*}expiration} = [VNA \times (interestfactor - 1)] X \left[\left[\left(\frac{Exp}{100} + 1 \right)^{\frac{1}{252}} - 1 \right] \times \frac{P}{100} + 1 \right]^{du_i}$$

- For the other interests expiration dates in the flow an adjustment of the expectation is performed for the periods between payments. For such, the interests curve **forward rate** is calculated at the Inter-financial deposits Rate (expectation), incorporating the interests on the indexer, defined in the deed:

$$Forward_i = \frac{\left[\left[\left(\frac{Exp_i}{100} + 1 \right)^{\frac{1}{252}} - 1 \right] \times \frac{P}{100} + 1 \right]^{du_i}}{\left[\left[\left(\frac{Exp_{i-1}}{100} + 1 \right)^{\frac{1}{252}} - 1 \right] \times \frac{P}{100} + 1 \right]^{du_{i-1}}}$$

where:

du_i and du_{i-1} – business days between the dates of each future interests payment event.

$$PaymentInterests_i = (VNE) x Forward_i$$

- The formula for calculation of interests payment for debentures remunerated based on INTER-FINANCIAL DEPOSITS + Spread (INTER-FINANCIAL DEPOSITS+%), is as follows:

$$PaymentInterests = [VNA \times (interestfactor - 1)] X \left[\left(\frac{Spread}{100} + 1 \right) \right]^{\frac{du}{252}}$$

for securities referred to in INTER-FINANCIAL DEPOSITS + Spread;

1 st Interests Installment	01/Jun/2006	107	125	17.0	903.098612		840.364824
2 nd Interests Installment	01/Dec/2006	233	126	16.5	854.491898		733.632192
Principal + 3 rd Interests Instl.	01/Jun/2007	357	124	15.5	716.801107	10.000,00	8,596.406115
Sum (Unitary Price)							10,170.403131

INTER-FINANCIAL DEPOSITS + Spread Securities - example MRSL13 – Issuance Rate INTER-FINANCIAL DEPOSITS + 1.2% Hypothetical rate used in the example: 0.95% - for 12/27/2005
VNE (R\$): 10,000.00
VNA (R\$): 10,000.00
UNIT PRICEPAR Calculation = VNA * Interests Factor = 10,598.94979
Interests Factor = {Mult[(1+INTER-FINANCIAL DEPOSITS rate year/100)^(1/252)]}*[(1+1,20/100)^(du/252)]
Interests Factor = 1.05593889*1.00374651=1.05989497
Interest and Principal Payments
1 st Interest Installment = 10,598.94979* [(1.20/100+1)^(44/252)-1] = 22,09814
2 nd Interest Installment = 10,000.00 * [(1.20/100+1)^(128/252)-1] = 60,77349
3 rd Interest Installment = 10,000.00 * [(1.20/100+1)^(121/252)-1] = 57,440415
4 th Interest Installment = 10,000.00 * [(1.20/100+1)^(129/252)-1] = 61,249736
5 th Interest Installment = 10,000.00 * [(1.20/100+1)^(122/252)-1] = 57,916501
6 th Interest Installment = 10,000.00 * [(1.20/100+1)^(126/252)-1] = 59,821071
Inter-financial depositsscounted Payments
1 st Interest Installment = [(UNIT PRICEPAR-VNA) + Interest Installment + Principal Payment]/[(0,95/100+1)^44/252] = (598.94979 + 22,09814)/1.00165226 = R\$ 620,0234918
2 nd Interest Installment = (Interest Installment + Principal Payment)/[(0,95/100+1)^172/252] = (60.773492)/1.00647439 = R\$ 60.382551
3 rd Interest Installment = (Interest Installment + Principal Payment)/[(0,95/100+1)^293/252] = (57.440415)/1.011054 = R\$ 56,812402
4 th Interest Installment = (Interest Installment + Principal Payment)/[(0,95/100+1)^422/252] = (61.249736)/1.015959 = R\$ 60,287567
5 th Interest Installment = (Interest Installment + Principal Payment)/[(0,95/100+1)^544/252] = (57.916501)/1.020621 = R\$ 56,746342
Principal + 6 th Interest Installment = (59.821071+10,000)/[(0,95/100+1)^670/252] = (10,059.821071)/1.025457 = R\$ 9.810,082296

Payment Flow of debenture MRSL13 as from Excel and the hypothetical rate of 0,95% pa:							
Event(s)	Settlement Date	Business Days	Business Days Between Payments	Interests Expectations %	Interest Payments (R\$)	Payment of Principal (R\$)	Inter-financial depositsscounted Flow (R\$)
Interests	01/Mar/2006	44	123	0	22.09814	0	620,023487
Interests	01/Sep/2006	172	128	0	60.773492	0	60.382551
Interests	01/Mar/2007	293	121	0	57.440415	0	56.812402
Interests	03/Sep/2007	422	129	0	61.249736	0	60.287567
Interests	03/Mar/2008	544	122	0	57.916501		56.746342
Interests, Expiration	01/Sep/2008	570	126	0	59.821071	10,000.00	9810.082296
Sum (Unitary Price)							10,664.334645

3.2 - UNIT PRICE of IGP-M remunerated securities

- The issuance face values of the IGP-M corrected debentures will be monetarily updated. The VNA (Updated Face Value) calculation is summarized to the securities issuance value (discounting the amortization payments) updated by the IGP-M, since their issuance or last correction payment up to the reference date.
- Therefore, the VNA (Updated Face Value) updating by the IGP-M, as Unit Price calculation base is according to three formulas, pursuant to releasing of index determined every month:

1st case: VNA calculation in the first business day in the month. Obtained directly with the SND - National Debentures System database, which uses the latest published index and fully respects the updating criteria defined in the debentures deeds.

$$\boxed{VNA = VNASND}, \text{ where:}$$

VNA - face value updated with six decimal positions, no rounding.

2nd case: VNA calculation after the first business day in the month and before releasing of the IGP-M determined for the month. In this case, as VNA correction factor it is used the IGP-M projection published by the ANDIMA Macroeconomic Committee, with up eight decimal positions, no rounding.

$$\boxed{VNA = VNASND_{\text{day1}} \times \left(\frac{\text{IGPMProjection}}{100} + 1 \right)^{\left(\frac{dp}{dt} \right)}}$$

3rd case: VNA calculation on the day of IGP-M releasing. Usually published in the penultimate business day of every month, the appropriation of the final index is made pro-rata business days, according with the issuance deed.

$$\boxed{VNA = VNASND_{\text{day1}} \times \left(\frac{NI_{k+1}}{NI_k} \right)^{\left(\frac{dp}{dt} \right)}, \text{ where:}}$$

NI_{k+1} - Value of IGP-M index –number in the current month;

NI_k - Value of index -number of the month previous to the updating month, in case the updating is in a date previous to the asset anniversary date;

dp – Number of business/running days between the last anniversary date and the calculation date, dp being a whole number;

dt – Number of business/running days included between the last and the next anniversary date, dt being a whole number;

Note: the expression $\left(\frac{NI_{k+1}}{NI_k} \right)$ with eight decimal positions.

- The Unit Price PAR calculation corresponds to VNA (Updated Nominal Value) added of the security interests, defined in the issuance deed.

$$\boxed{PUPAR = VNA \times \left(\frac{\text{Interests}}{100} + 1 \right)}$$

$$\boxed{\text{Interests} = \left\{ \left[\left(\frac{i}{100} + 1 \right)^{\frac{n}{N}} \right] - 1 \right\} \times 100}$$

$$PaymentInterests = (VNA) X \left(\frac{Interests}{100} \right)$$

where:

i – Interests as percentage per year as defined in the issuance deed, informed with four decimal positions.

N – Number of days representative of the rate, which could be, as informed the values 360 or 365 running days or 252 business days, N being a whole number.

n – When “N” is equal to 360 or 365 days, “n” will assume the number of running days between the next event date and the previous event date. When “N” is equal to 252 days, “n” will assume the number of business days between the next event date and the previous event date, n being a whole number.

- The Unitary Price of the operation is the aggregate of the interests and principal payments, discounted (forwarded to present day value) by indicative rate, published by ANDIMA with six decimal positions, no rounding. The formula is as follows:

$$PUofOperation = \sum_{i=1}^n \left\{ \frac{InterestsPayment_i + PrincipalPayment_i}{\left[\left(\frac{IndicativeRate}{100} + 1 \right)^{\frac{dt_i}{252}} \right]} \right\}$$

where:

Indicative Rate – Indicative Rate ascertained and published by ANDIMA, used for calculation of Unit Price with 4 decimals positions, no rounding.

IGPM + Spread Securities - example PETR13 – Issuance Rate: IGPM + 10.3%	
Hypothetical rate used in the example: 9.25% - for 12/27/2005	
VNE (R\$):	10,000.00
VNA (R\$):	VNASND _{1st day in the month} * (IGPM projection /100+1) ^(18/22)
VNA Calculation =	1,402.14850 * [(-0.06/100+1) ^(18/22)] = 1,401.457486
PUPAR (R\$) =	VNA * (Interests Factor)
Interests Factor =	{[(10.30/100+1) ^(58/252)] = 1.022820
UNIT PRICEPAR (R\$) =	1,401.457486 * (1.022820) = 1.433.438463
Interest and Principal Payments	
1 st Interest Installment =	1,401.457486 * {[(10.3/100+1) ^(250/252) -1] = 143.14778
2 nd Interest Installment =	1,401.457486 * {[(10.3/100+1) ^(249/252) -1] = 142.547103
3 rd Interest Installment =	1,401.457486 * {[(10.3/100+1) ^(251/252) -1] = 143.748881
4 th Interest Installment =	1,401.457486 * {[(10.3/100+1) ^(252/252) -1] = 144.35012
5 th Interest Installment =	1,401.457486 * {[(10.3/100+1) ^(251/252) -1] = 143.748881
Inter-financial depositsscounted Payments	
1 st Interest Installment =	(Interest Installment + Principal Payment)/[(9.25/100+1) ^{192/252}] = (143.14778)/1.0069728 = R\$ 133.817045
2 nd Interest Installment =	(Interest Installment + Principal Payment)/[(9.25/100+1) ^{441/252}] = (142.547103)/1.167448 = R\$ 122.101462
3 rd Interest Installment =	(Interest Installment + Principal Payment)/[(9.25/100+1) ^{692/252}] = (143.748881)/1.274989 = R\$ 112.745174
4 th Interest Installment =	(Interest Installment + Principal Payment)/[(9.25/100+1) ^{944/252}] = (144.35012)/1.392926 = R\$ 103.630881
Principal + 5 th Interest Installment =	(Interest Installment + Principal Payment)/[(9.25/100+1) ^{1195/252}] = 1.545.206367/1.521237 = R\$ 1,015.756365

Payment Flow of debenture PETR13 as from Excel and the hypothetical indicative rate of 9,25% pa.:							
Event(s)	Settlement Date	Business Days	Days Between Payments	Interests %	Interest Payments	Payment of Principal	Inter-financial depositsscounted Flow (R\$)
Interests	02/Oct/2006	192	250	10.2142	143.147880	0	133.817045

Interests	01/Oct/2007	441	249	10.1713	142.547103	0	122.101462
Interests	02/Oct/2008	692	251	10.2571	143.748881	0	112.745174
Interests	02/Oct/2009	944	252	10.3000	144.350120	0	103.630881
Interests, Expiration	02/Oct/2010	1195	251	10.2571	143.748881	1.401.457.480	1.015.756365

Sum (Unitary Price)	1.488.050927
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4 - Bibliography

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