

AVERAGE REDEMPTION YIELD
ON SELECTED ITALIAN GOVERNMENT
SECURITIES AND BONDS

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1. *Aims*

The importance of having an indicator reflecting the average yield on listed fixed-interest securities is clear. In general terms it provides a barometer of interest rates. In more technical terms, it provides a useful yardstick for investors and borrowers alike.

Mediobanca set out to meet this requirement early in 1966, when it first produced figures showing the average yield on selected bonds. Since then, however, the bond market has evolved to a considerable degree, with new debt instruments and ways of providing a return for investors being developed. Index-linked securities have acquired particular significance, providing as they do rates of interest and redemption values that are related to price movements. This type of bond, pioneered by ENEL (the Italian National Electricity Authority) in 1974, was given a major boost in 1977 with the introduction of floating rate Treasury Credit Certificates. The size of the market should not be overlooked either. In 1966 the value of securities in issue totalled 15,834 billion lire. By 1985, this had grown to 637,461 billions, representing a forty-fold increase, set against the sixteen-fold rise in Italy's GDP over the same period.

In the light of this growth, the basis on which average bond yield is computed was revised in October 1986 by preparing two new indicators, one for fixed-interest and one for index-linked securities, aimed at reflecting both changes in the market and using a method more suitable for depicting such changes. The new indicators continue to be based on prices quoted on the Stock Exchange, which represents a kind of retail market for bonds. Although these quotations cannot fully reflect overall trends on the much larger money market, they nonetheless provide a fair indicator of interest rate levels.

2. *The mathematical formula*

Redemption yield on each issue is computed as the internal rate of return which makes the present value of the future income stream in the

form of principal, interest and bonuses equal to the market price of the issue. The following formula is used:

$$C_o = \sum \frac{S_k}{(1 + i)^k}$$

where:

C_o = the market value of the issue at the date on which the yield is computed, adjusted to include accrued interest (*tel quel* price);

$S_1, S_2, \dots, S_k, \dots, S_n$ = principal, interest and bonuses receivable (future income stream);

$K = 1, 2, \dots, n$ = number of years (or fractions of a year based on calendar days) elapsing between the reference date (date on which yield is calculated) and dates on which proceeds S_k fall due;

i = redemption yield.

For purposes of computing redemption yield, the market quotation is adjusted to the *tel quel* price by adding interest accrued between the last interest payment date and the reference date, based on the nominal rate carried by the current interest coupon. In accordance with stock market practice, accrued interest since 4 January, 1999 has been based on actual days elapsed (the “Act/Act” basis). It was previously calculated on the basis of a 12-month 360-day business year. The *tel quel* price is thus the price payable by purchasers. The value date of the purchase is based on the reference date.

Interest as yet undetermined on index-linked securities is calculated on the basis of the most recent reference parameters. Specifically, interest maturing during the remaining life of an issue is determined as follows:

Fully determined coupon: where all the parameters are known, calculations are based on them (this is the case with the current interest coupon, and sometimes that immediately following it);

Partially determined coupon: where only some of the parameters are known, calculations are based on them. These are progressively adjusted in order to approach as closely as possible the fully determined coupon (this is often the case with the interest coupon immediately following the current coupon). The calculation is up-dated every time revised reference parameters come to hand;

Expected coupon: where none of the parameters is known, calculations are based on their most recent values (this is the case with most coupons following the current coupon). The calculation is up-dated every time revised parameters come to hand. When Ordinary Treasury Bill yields are used, the figures are based only on end-month auctions which are considered to be more significant than those held in mid-month.

A similar procedure is applied for indexing redemptions of principal.

3. *Basis on which bonds are selected*

The sample from which average yield is calculated consists of bonds having a life to redemption in excess of two years and an annual trading volume of more than one billion lire (EUR 516,457). For purposes of including new issues, volume is calculated every three months. Bonds are eliminated from the sample when their life to redemption falls below two years and their trading volume is no longer significant.

The sample also excludes (i) bonds having redemption schedules in which uncertainties are such as to preclude calculating yield, e.g., some open-ended issues, (ii) convertible bonds, for so long as they are convertible, (iii) bonds with unexercised warrants and (iv) bonds denominated in currencies other than the lira (EUR).

4. *Weighting*

Average yield is computed by weighting the bonds on the basis of volume traded (at par), which provides the most reliable yardstick for the yield they produce on the market. Weights are determined by a moving

average of volume traded in the last five business days. The weights are built in using the following formula:

$$W_h = \frac{Q_h}{\Sigma Q_h}$$

where:

W_h = weight of bond h ;

Q_h = trading volume of bond h in last five business days

where h represents the generic bond in the sample.

The weighting method described is subjected to two constraints:

- a) the weight of bonds with lives to redemption of between 2 and 3 years (the yield on which could be anomalous to some degree) is not allowed to exceed 25%;
- b) the weight of bonds issued by any individual borrower (whose performance and policies could produce anomalous yields) is not allowed to exceed 50%.

Constraint *a*) is met by eliminating in advance bonds with shorter lives, where appropriate. Constraint *b*) is met by automatically reducing to 50% the overall weight of the predominant borrower so long as that situation continues, and by readjusting the weights of the other borrowers in proportion.

5. Yield calculations

Mediobanca's Research Department calculates the average yield on fixed-interest and index-linked securities on a daily basis, without allowing for any deduction of tax. These daily yields thus form the weekly yield (equal to the arithmetic mean of the daily yields).

The following weekly data on both types of security are made available:

1. average yield on all bonds in the sample;
2. average yield on bonds classified by life to redemption as follows:
 - a) more than three years to five years;
 - b) more than five years to seven years;
 - c) over seven years;
3. the percentage contribution of each borrower to the average yield of all securities in the sample.

A moving average of weekly yields retroactively based on 13-week periods has also been computed in order to smooth out short-term fluctuations that could occur in the indicator.

Average daily yields on all the fixed-interest and index-linked securities are also available on request.