Malaysian
Bond Indexes

Prepared by
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Technical Manual
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1. Overview

1.1. Summary

RAM quant shop MGS Bond Index, first formulated in February 1998 as a monthly index, is being expanded to provide users with higher frequency as well as expanded coverage. Major improvements described in this manual are the introduction of:

1. Weekly calculation of the existing MGS Index;

2. A range of weekly indexes covering **Khazanah, Cagamas and Corporate bonds, both conventional and Islamic securities** and the overall market.

These changes ensure the Indexes continue to provide Malaysian and international fund managers and fixed income market participants with bond indexes calculated using internationally accepted practices.

1.2. Benefits to Fixed Income Market Participants

Fund Sponsor or Trustee

RAM quant shop Bond Indexes provide an independently created market index for comparisons of manager and fund performance in the same way as equity indexes are available.

Fund Managers

The indexes provide managers with a tool that can:
- Serve as an acceptable benchmark to measure performance against, free of credit risk;
- Use as the bases to run passive portfolios which will match the index;
- Demonstrate added value to Plan Sponsors.

1.3. International Practice

The RAM quant shop Bond Indexes follow international convention with respect to:

- **Coverage of Index:** The indexes are representative of the Malaysian bond market in terms of weights and coverage.

- **Ability to replicate:** The indexes contain stocks that can be dealt in the market and are known in advance. This ensures a portfolio that will track the index can be constructed.

- **Release Times:** Values are available shortly after the market closes.

- **Market Movements:** Return calculations are based on changes in the value of a portfolio so the index will reflect market movements.

- **Accurate Data Source:** The indexes use prices and yields issued by Bank Negara Malaysia (Central Bank of Malaysia) as the basis of calculation.

- **Choice of Maturity:** There is a choice of sub indexes to ensure the specific needs of market participants are meet.

2.   Details of Index Calculations

RAM quant shop Malaysia Bond Indexes have been developed to measure the performance of the Malaysian fixed income market. To achieve this, a range of indexes with different credit and maturities was constructed.

2.1 Securities Covered

2.1.1 MGS Indexes

Issuer	Malaysian Government
Credit	Government Guaranteed
Issues Included	All
Minimum Size	na
Source of Securities	Bank Negara Malaysia– bond market pages http://www.bnm.gov.my/en/Statistics/mgs.asp
Frequency	Weekly
Sub Indexes	All Series (greater than 1 year) 1-3 years (1 year and less than 7 years 3-7 years (3 years and less than 7 years) 7+ years (7 years and greater) 1-5 years (1 year and less than 5 years) NEW 5-10 years (5 years and less than 10 years) NEW 10+ years (10 years and greater) NEW 1-10 years (1 year and less than 10 years) NEW 0+ (all securities) NEW 0-5 (all securities with a maturity less than 5 years) NEW 0-5 (all securities with a maturity less than 10 years) NEW

2.1.2 GII Indexes

Issuer	Malaysian Government
Credit	Government Guaranteed
Issues Included	All
Minimum Size	na
Source of Securities	Bank Negara Malaysia
Frequency	Weekly
Sub Indexes	All Series (greater than 1 year) NEW 1-3 years (1 year and less than 7 years) NEW 3-7 years (3 years and less than 7 years) NEW 7+ years (7 years and greater) NEW 1-5 years (1 year and less than 5 years) 5-10 years (5 years and less than 10 years) NEW 10+ years (10 years and greater) NEW 1-10 years (1 year and less than 10 years) NEW 0+ (all securities) NEW 0-5 (all securities with a maturity less than 5 years) NEW 0-5 (all securities with a maturity less than 10 years) NEW

2.1.3 Cagamas Indexes

Issuer	Malaysian Government
Credit	Government Guaranteed
Issues Included	Straight, semi annual coupon securities
Minimum Size	na
Source of Securities	Bank Negara
Frequency	Weekly
Sub Indexes	All Series (greater than 1 year) NEW 1-3 years (1 year and less than 7 years) NEW 3-7 years (3 years and less than 7 years) NEW 7+ years (7 years and greater) NEW 1-5 years (1 year and less than 5 years) 5-10 years (5 years and less than 10 years) NEW 10+ years (10 years and greater) NEW 1-10 years (1 year and less than 10 years) NEW 0+ (all securities) NEW 0-5 (all securities with a maturity less than 5 years) NEW 0-5 (all securities with a maturity less than 10 years) NEW

2.1.4 Khazanah Indexes

Issuer	Malaysian Government
Credit	Government Guaranteed
Issues Included	zero coupon securities
Minimum Size	na
Source of Securities	Bank Negara
Frequency	Weekly
Sub Indexes	All Series (greater than 1 year) NEW 1-3 years (1 year and less than 7 years) NEW 3-7 years (3 years and less than 7 years) NEW 7+ years (7 years and greater) NEW 1-5 years (1 year and less than 5 years) 5-10 years (5 years and less than 10 years) NEW 10+ years (10 years and greater) NEW 1-10 years (1 year and less than 10 years) NEW 0+ (all securities) NEW 0-5 (all securities with a maturity less than 5 years) NEW 0-5 (all securities with a maturity less than 10 years) NEW

2.1.5 Corporate Indexes

Issuer	Various
Credit	A1 or better minimum rating by any recognized rating agency
Issues Included	Straight, semi annual coupon securities
Minimum Size	individual securities must have at least RM 150 million on issue
Source of Securities	RAM and MARC
Frequency	Weekly
Sub Indexes	All Series (greater than 1 year) NEW 1-3 years (1 year and less than 7 years) NEW 3-7 years (3 years and less than 7 years) NEW 7+ years (7 years and greater) NEW 1-5 years (1 year and less than 5 years) 5-10 years (5 years and less than 10 years) NEW 10+ years (10 years and greater) NEW 1-10 years (1 year and less than 10 years) NEW 0+ (all securities) NEW 0-5 (all securities with a maturity less than 5 years) NEW 0-5 (all securities with a maturity less than 10 years) NEW

2.1.6 Composite Indexes – combination of each of the indexes based on market value. This group of indexes is published weekly.

2.2 Pricing and Calculations

Weekly Indexes:

Start Level	1000.00
Revaluations	Weekly, see formula shown in section 4
Pricing basis	MGS – Clean prices provided by Bank Negara Malaysia on http://www.bnm.gov.my/en/Statistics/mgs.asp All Other Indexes - Yields as shown by Bank Negara Malaysia on http://www.bnm.gov.my/en/Statistics/mgs.asp
Weightings	Gross market value including accrued interest on date of revaluation
Reinvestment	Daily, with coupons added in coupon payment dates and interest accrued until the next revaluation date.
Rebalancing	Occurs when a bond has matured or there has been a change in the securities on issue.

2.3 Inclusion and Exclusion of Securities in the Index

New Issue   Included on the date on which issues or reissues of bonds are added to the index is the next revaluation day after the bond is issued.

Maturity/Change   The relevant security is deleted from the next valuation day after the change occurs.

Between Sub-Indices Occurs at exactly ten, seven, five, three and one year(s) prior to the maturity of a bond. Each movement involves both additions and deletions to indices.

2.4 Sub Indexes

The separate indexes created under each series allows market participants to better target their portfolio requirements with a benchmark.

The relative weightings at end 2004 can be seen in following table:

Table 1: Weightings of various sub Indexes in the final Combined Index

Sub Index	MGS	GII	Cagamas	Khazanah	Corporate	Total
0+	65	2	10	4	20	100
1+	58	2	8	4	19	90
1 - 3 yr	19	1	6	1	2	29
3 - 7 yr	20	1	2	2	9	34
7+ yr	20				7	27
1 - 5 yr	37	2	8	4	8	57
5 - 10 yr	15				7	22
10+ yr	7				4	11
1 – 10 yr	51	2	8	4	14	79
0 - 5 yr	43	2	10	4	9	67
0 – 10 yr	58	2	10	4	16	89

3.   Using Bond Indices

3.1   Causes of Index level changes

- **Accrued Interest:** With the passage of time, the accumulation index will steadily increase due to the interest earned on the bonds in the index portfolio. Since the bond price includes the value of accumulated interest, this effect occurs day-by-day, rather than just on coupon payment days. This impact must always be positive.

- **Changing Yields:** The major source of movements. A rise in yields implies a fall in prices and the index. A fall in current yields, all other things equal, implies a rise in the index.

- **Reducing Maturity:** The closer the bond is to maturity the smaller will be the impact of differences between yields (market price) and coupon (determined at issue). So bonds priced at a discount will slowly increase in value over time all other things being equal, while bonds priced at a premium will slowly decrease in value.

3.2   Weights in the Index

The RAM quant shop Indices are market weighted – that is the weight of a security in the index is the market value of that security on issue divided by the total value of all securities on issue. That is:

Market Value of Security/Total Value of all Securities on Issue.

3.3   Rebalancing

The index automatically rebalances for price changes. A rise in the price of a particular bond will increase its weighting in proportion to the rise in market value.

So the portfolio representing the index only needs to be revalued to provide a new index value.

Rebalancing will occur on a pricing date when one of the following will occur:

- coupon payment (on the coupon payment date);
- maturity (on the maturity date);
- new issue of a new bond;
- any other change in the amount on issue.

At a pricing date, the portfolio is:

- revalued (using the day's closing yields) to provide the index figure;
- rebalanced for the next period.

As the number and volume of bond series on issue changes the index is not distorted by changes in composition of the index. Essentially this is because all the bonds in the index at the end of a given day are sold for their end-of-day prices. The proceeds are then used to purchase a new set of bonds in their market value proportions.

3.4. Reinvestment

All coupons and maturities are reinvested in securities at their market value proportions on valuation day.

So coupon income from a bond is reinvested across the whole portfolio. This takes place on the coupon payment date not on the ex-interest date, as the coupon cash would not be available until the payment date in a real portfolio. The coupon earns the yield associated with the period between the ex-interest and interest payment dates.

4. Index Information

4.1 Source of Index levels and statistics

Information on the indices is publicly available from a wide range of sources. As this is free, please acknowledge the source as RAM quant shop.

Information	Index levels, average yield, duration and convexity Securities and weights in the index Prices used
From	http://www.quantshop.com/malaysian%20bond.htm RAM

Information	Index levels
From	Bloomberg Reuters

4.2 Relevant formula

The following formula is applied in calculating the indexes.

4.2.1 Price of a bond

$$\Pr ice = \frac{N}{(1+j)\left(n^{j}+\frac{a}{b}\right)} + \sum_{k=1}^{n} \frac{R}{(1=j)\left(k-1+\frac{a}{b}\right)} - \left(R\frac{c}{b}\right)$$

Where

N	the principal of the bond($)
R	the annual Coupon Interest Rate divided by 200i.e. the semi annual
j	the Yield divided by 200 i.e. the semi annual yield (%)
n	the number of full half years between the next Coupon Interest Payment date and the Maturity date
a	the number of days from the Settlement date to the next Coupon
b	the number of days in the half year ending on the next Coupon Interest Payment date
c	number of days in coupon period in which the settlement date falls

4.2.2 Macaulay duration – a simple summary statistic of the effective average maturity of the portfolio

$$MDuration = \frac{Duration}{1 + \frac{MarketYield}{Coupon\ payments\ per\ year}}$$

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4.2.3 Convexity – Measures the rate of change of duration as yields change.

$$Convexity = \frac{V_+ + V_- - 2V_0}{2V_0(\Delta y)^2}$$

where

$V_+ = V_0 + (\Delta y)$

$V_- = V_0 - (\Delta y)$

$V_0 = original\ price$

$\Delta y = 0.002$

5.   Contacts for further information

For further information, including historical data in electronic form, please contact:

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