

J.P. Morgan Volatility Adjusted Real-Rates Bond Index

Methodology and Factsheet

Highlights

The J.P. Morgan Volatility Adjusted Real-Rates Bond Index (VARRI), part of the J.P. Morgan Macro Aware™ family of indices, enhances the well-established methodology and composition of the J.P. Morgan Government Bond Index (GBI), with a design uplift to achieve a higher real-yield (inflation adjusted). Unlike traditional bond indices that focus on market value weighting, the VARRI applies a Macro Aware™ methodology to overweight sovereign exposure to higher real yields (volatility adjusted) and underweight those markets with lower real yields. The index utilizes macro signals (inflation expectations) from the J.P. Morgan Macrosynergy Quantamental System (JPMaQS) and implied volatility estimates from J.P. Morgan Research.

Index Criteria

Instrument Type:	Global Government Bonds belonging to the GBI Broad (ex US) benchmark. <ul style="list-style-type: none"> • Includes: Fixed-rate and zero-coupon bonds • Excludes: Floating-rate bonds, capitalizing/amortizing bonds, bonds with callable, puttable, or convertible features
Remaining Maturity:	> 6 months
Currency Denomination:	Denominated in onshore, floating currency regimes
Issuers:	Central governments
Country of Domicile:	All markets included in the GBI-Broad (excluding the US)
Taxability:	Taxable and tax exempt are eligible
Capital Controls:	Excludes countries with explicit capital controls or where foreign investors face constraints in: <ul style="list-style-type: none"> • Holdings or transacting in bonds • Purchase or sale of spot FX

Index Characteristics & Methodology

Pricing:	Mid prices are taken from a third party pricing source, PricingDirect
Aggregate Return:	Weighted average of bond returns using mid side prices
Rebalancing:	Rebalances on the last weekday of the month. If FX rates from WM Reuters are unavailable on the last weekday of the month (e.g., Good Friday), indices are rebalanced on the previous business day.
Coupon Reinvestment:	Immediately reinvested in to the respective local market returns
FX Rates:	All FX rates used for unhedged returns are as of 4pm London time provided by WM/Reuters
Weighting:	Baseline market capitalization based weighting scheme of the GBI Broad Ex. US, subject to a Macro Aware™ methodology which dynamically overweights sovereign exposure to higher real yields (underweights those with lower real yields)
Price Timing:	As of the local market close

Settlement Convention:	Local market country convention
Holiday Calendar:	Local market calendar
Macro Aware™ Inputs	<ul style="list-style-type: none"> • Est. 1-year ahead inflation expectations (source: JPMAQS) • Implied volatility based on 3-month At-The-Money (ATM) FX Options (source: J.P. Morgan) <p>Historical revisions to the underlying Macro Aware™ input data (post-index production) will be considered in the next rebalance and will not result in an index restatement (post-revision).</p>

Defining the universe of eligible countries

The J.P. Morgan Volatility Adjusted Real-Rates Bond Index includes liquid, bullet, fixed- rate local debt issued from countries with floating currency regimes, as defined by the [J.P. Morgan Government Bond \(GBI\) Broad Index](#) (ex. United States).

This index does not exclude countries based on credit ratings and therefore can potentially span both investment grade and sub-investment grade government bond markets.

Instrument type

Only fixed-rate and zero coupon instruments are included. Floating-rate and capitalizing/amortizing bonds, or bonds with callable, puttable or convertible features are not part of the index.

Liquidity

A key feature that distinguishes our indices from other index products is the strict enforcement of liquidity criteria in the selection of instruments. Yet, while the notion of liquidity differs from market to market, J.P. Morgan indices only include securities, subject to several considerations including but not limited to:

- *Pricing:* Bonds must trade with enough frequency to prevent stale price quotations
- *Availability:* Bonds must be regularly traded in size at acceptable bid-offer spreads and readily redeemable for cash. A reasonable two-way market must exist for the instrument to be included in the index portfolio.
- *Replication costs:* Investors should be able to replicate the index without incurring excessive transaction costs.

Index Methodology

The J.P. Morgan Volatility Adjusted Real-Rates Bond Index overweights (OW) the top three countries with the highest “Real-Rate Factor” and underweights (UW) the bottom three markets. The Real-Rate Factor is calculated by discounting the nominal benchmark yields of each sovereign market by their respective JPMAQS estimated 1-year ahead inflation expectations¹, and dividing by each market’s local currency 3-month At-The-Money (ATM) implied volatility (IV).

Mechanically, an overweight assignment corresponds to a +1.5% allocation for the corresponding country in the benchmark, while an underweight carries a -1.0% allocation and a market-weight (MW) is held flat. A floor of 0% is also imposed for UW countries to avoid reflecting a short position. Once factor adjustments have been applied, we normalize to produce terminal country weights assignments.

As additional notes: countries without a 1-year inflation expectation figure, as provided by JPMAQS, were excluded from the index calculation; Euro denominated countries all use the EUR/USD 3M ATM IV when computing the real-rate factor.

JPMAQS Criteria

The J.P. Morgan Volatility Adjusted Real-Rates Bond Index uses the J.P. Morgan Macrosynergy Quantamental System to inform the Macro Aware™ methodology used as an overlay to the flagship J.P. Morgan GBI-Broad ex. US Index.

¹ Estimated CPI inflation expectations of market participants for 12 months after the latest reported CPI data (Macrosynergy method)

JPMaQS is a service which provides quantitative-fundamental (quantamental) data in line with the information available to market participants at the time of release, not an ex-post (revised) number.

Quantamental Indicators	Economic Trends Macroeconomic Balance Sheets Financial Conditions Shock and Risk measures Stylized Trading Factors
Data Availability	Coverage for 35+ countries (including Euro Area); 20+ years of historical data
Data Frequency	Daily, Monthly, Yearly

Source: JPMorgan Chase & Co.

Bond calculations

Calculations are according to market convention: all calculations including accrued interest, duration, yield, etc., are done according to local market convention using parameters (ex-dividend rules, settlement conventions, etc.) relevant to each specific bond. All calculations are gross of tax and ignore transactions costs.

Bond pricing: Pricing for our underlying instruments is provided on a daily basis from Pricing Direct, a third party valuation vendor. In the event the primary source for pricing is unable to provide a quote, the Index Group reserves the right to consider the use of an appropriate alternative source for index inputs. Please see <http://www.pricing-direct.com> for further details.

Ex-dividend rules: ex-dividend rules, when applicable, are incorporated into accrued interest calculations, as appropriate, by country. Ex-dividend rules define the last day a bondholder must own a bond to receive that bond's next coupon payment, otherwise known as the ex-dividend date.

- During the period between the ex-dividend date and the coupon date, the bond trades "ex-dividend"
- An investor who purchases a bond for settlement between the ex-dividend date and coupon date will not receive that bond's next coupon payment.
- During this period, according to market convention, accrued interest becomes negative resulting in a total price at a discount to the clean price and in effect, compensating the investor for the time the bond will be held without interest.
- On coupon date, interest will start to accrue for the subsequent coupon payment.

Returns and return indices: return indices on individual bonds are calculated on a daily basis and measure bond performance over time:

- Principal return index is based on changes in clean price.
- Interest return index is based on changes in accrued interest.
- Total return index is based on changes in both clean price and accrued interest.

At the individual bond level focus is on total return. The segregation of interest and principal return becomes relevant at the portfolio level.

Reinvestment of coupons: the J.P. Morgan indices are always fully invested. All coupons received are immediately reinvested back into the local market.

Interest accruals: interest is accrued starting from the bond's dated date up to the first coupon value date. Accrued interest is calculated according to market convention, on a settlement day basis. Interest is accrued by value or settlement date. Weekly, seven days of interest are accrued, including the weekend.

In markets with ex-dividend rules, if a bond is purchased after the ex-dividend date the purchaser will not receive the bond's next coupon. In order to compensate the buyer of the bond, the price paid for the bond must be less than the clean market price, thus, accrued interest will be negative.

Coupon value date: The coupon value date is the trade date associated with settlement on coupon date (the day the coupon is paid). Thus, the coupon value date is the last trade date which an investor may purchase a bond and have that bond settle prior to payment of the subsequent coupon. On coupon value date, accrued interest resets to zero, and accruals begin towards the next coupon.

Yield: effective annual rate of return, expressed as a percentage. For the J.P. Morgan Government Bond Index body of data, yields are all calculated as yield-to-maturity, which is the discount rate that the present value of future payments equals the price of the security.

Index calculations

The base for the index level is January 2, 2006 = 100.

Daily indicative pricing for each security and FX rate is closely scrutinized and are reconciled using market movements and other pricing sources as guidance. As necessary, an established alternate source will be used to maintain the integrity of daily index calculations. On any given calculation day, if the primary source is unable to provide a quote, the Index Group reserves the right to consider the use of an appropriate alternate source for index inputs, such as pricing and FX. If a permanent switch for the primary third party pricing source is necessary, clients will be notified in advance prior to any official switch.

For any questions or for additional information, please contact index.research@jpmorgan.com

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