J.P. Morgan Asia Credit Index Core (JACI Core)

Introduction and Methodology brief

- The J.P. Morgan Asia Credit Index Core (JACI Core) consists of liquid US-dollar denominated debt instruments issued out of Asia ex-Japan.
- JACI Core is based on the established J.P. Morgan Asia Credit Index (JACI), and follows its methodology closely. The correlation between the JACI and the JACI Core is high with the added advantage of including only the most liquid JACI bonds and providing additional country diversification.
- Historical returns and statistics for the JACI Core are available from December 30, 2005.

Index Overview

The J.P. Morgan Asia Credit Index (JACI) is our broadest, liquid US-dollar denominated Asia debt benchmark, and it tracks total returns for actively traded US-dollar denominated debt instruments in the Asia ex-Japan region. There are established rules that govern the composition of the JACI (please see, Asia Credit Perspectives Supplement: JPMorgan Asia Credit Index, 2006).

The instruments comprising the JACI Core are a subset of the JACI benchmark, and are included under a new weighting scheme designed to avoid concentrated exposure to any single country. The following table summarizes the inclusion criteria and country-weight differences between the JACI and the JACI Core:

<table>
<thead>
<tr>
<th>JACI Core</th>
<th>Existing JACI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum entry size</td>
<td>US$350 million</td>
</tr>
<tr>
<td>Minimum time to Maturity</td>
<td>24 months; 30 months at time of entry to Index</td>
</tr>
<tr>
<td>Index Weighting</td>
<td>Diversified approach</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% weights</th>
<th>JACI Core</th>
<th>JACI</th>
<th>Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>0.0</td>
<td>0.06</td>
<td>-0.06</td>
</tr>
<tr>
<td>China</td>
<td>12.52</td>
<td>29.16</td>
<td>-16.63</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>12.94</td>
<td>12.83</td>
<td>0.11</td>
</tr>
<tr>
<td>India</td>
<td>11.13</td>
<td>8.63</td>
<td>2.51</td>
</tr>
<tr>
<td>Indonesia</td>
<td>12.78</td>
<td>10.50</td>
<td>2.28</td>
</tr>
<tr>
<td>South Korea</td>
<td>12.95</td>
<td>15.80</td>
<td>-2.85</td>
</tr>
<tr>
<td>Macau</td>
<td>1.09</td>
<td>0.50</td>
<td>0.59</td>
</tr>
<tr>
<td>Malaysia</td>
<td>4.28</td>
<td>2.94</td>
<td>1.33</td>
</tr>
<tr>
<td>Mongolia</td>
<td>0.99</td>
<td>0.45</td>
<td>0.54</td>
</tr>
<tr>
<td>Pakistan</td>
<td>1.23</td>
<td>0.72</td>
<td>0.51</td>
</tr>
<tr>
<td>Philippines</td>
<td>12.04</td>
<td>8.05</td>
<td>3.99</td>
</tr>
<tr>
<td>Singapore</td>
<td>8.55</td>
<td>5.35</td>
<td>3.20</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>2.85</td>
<td>1.31</td>
<td>1.55</td>
</tr>
<tr>
<td>Taiwan</td>
<td>0.97</td>
<td>0.51</td>
<td>0.46</td>
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<tr>
<td>Thailand</td>
<td>5.19</td>
<td>2.75</td>
<td>2.44</td>
</tr>
<tr>
<td>Vietnam</td>
<td>0.49</td>
<td>0.44</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Source: J.P. Morgan

See page 14 for analyst certification and important disclosures.

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Country and instrument selection process
As with the JACI, all countries within the Asia ex-Japan region are eligible for inclusion into the JACI Core. As of May 2014, 15 countries were included in the JACI Core: China, Hong Kong, Indonesia, India, South Korea, Sri Lanka, Macau, Malaysia, Mongolia, the Philippines, Pakistan, Singapore, Thailand, Taiwan and Vietnam.

The JACI Core instrument selection process and inclusion criteria
Instruments that satisfy all the following defined criteria will be eligible for inclusion in the JACI Core. With the exception of item 4 (Current face amount outstanding) and item 5 (Time until maturity), all selection criteria are consistent with the JACI:

1. Instrument type
2. Issuer type classification
3. Currency denomination
4. Current face amount outstanding
5. Time until maturity
6. Legal jurisdiction
7. Settlement method
8. Quantifiable source of cash flow return and
9. Quoted price availability

Instrument type
The JACI Core includes both fixed and floating rate instruments, as well as capitalizing/amortizing bonds or loans. Bonds or loans with embedded options and warrants are eligible for inclusion if a) the options/warrants are attached to instruments that would otherwise be included in the index and b) the quotation convention—as recommended by the Emerging Markets Traders Association (EMTA)—is for instrument prices to be quoted cumulative of options or warrants. Convertible bonds are not eligible for inclusion into the index.

Issuer type classification
The JACI Core contains only those bonds or loans issued by sovereign, quasi-sovereign and corporate entities from index-eligible countries. Instruments issued by municipalities or provinces are eligible for inclusion.

Instruments will not be eligible for inclusion in the index if their credit has been improved by a) giving security over commercial receivables or b) giving a guarantee from a guarantor which is not a subsidiary of the eventual obligor or the parent company/beneficiary of the issuer of the instrument.

Where financing vehicles are used, bonds or loans may be included in the JACI Core if either 1) the financing vehicle or bond is guaranteed by an index eligible issuer or 2) the transaction is structured as a pass-through where the creditor of the financing vehicle has full recourse to the underlying loan or bond between the financing vehicle and the final obligor, which itself must be an index eligible issuer.
In order to avoid double counting of index instruments, a bond or loan that is issued by a financing vehicle is only eligible for inclusion into the JACI Core, if the underlying loan or bond is not itself included in the index.

**Currency denomination**
Only those instruments denominated in US dollars are considered for inclusion. Instruments denominated in US dollars where the amount of coupon or redemption payment is linked to an exchange rate are not eligible for inclusion.

**Current face amount outstanding**
Only issues with a current face amount outstanding of US$350 million or more will be considered for inclusion.

If an issue’s current face outstanding falls below this requirement (due to either a debt retirement by the entity or the amortization of principal), the issue will be removed from the index at the next month-end rebalancing date.

Existing issues that, through re-openings, increase in size to satisfy our minimum current face outstanding requirement will be eligible for inclusion and follow the criteria applied to a new issue. For an existing issue in the index, any re-opening will be rebalanced in the month that it is settled.

**Time until maturity**
Only those instruments with at least 2 1/2 years until maturity are considered for inclusion. Once added, an instrument may remain in the JACI Core until 24 months before it matures. On the month-end preceding this anniversary, the instrument is removed from the index.

**Legal Jurisdiction**
Inclusion into the JACI Core is limited to issues with legal jurisdiction that is domestic to a G-7 country. Local law instruments or bonds that do not fall under G-7 jurisdiction are not eligible for the index.

**Settlement method**
Instruments in the JACI Core must be able to settle internationally (either through Euroclear or another institution domiciled outside the issuing country).

**Quantifiable source of cash flow return**
J.P. Morgan reserves the right to exclude from the composition of the JACI Core any debt instrument that it considers to have a cash flow structure from which verifiable daily returns or other statistics (i.e., yield, spreads) cannot be calculated.

**Quoted price availability**
The final requirement is that an issue’s bid and offer prices are available on a daily and timely basis from PricingDirect or an interdealer broker. The lack of availability of such prices prevents the addition of a new issue to the index. In the case of the current JACI Core issues, if reliable prices for an issue become unavailable during a month, it is removed from the index at its next month-end rebalancing date. Once an issue is removed, it will not be reconsidered for inclusion in the index during the next 12 months.
Timing of the addition/removal of instruments

A new issue that meets the JACI Core’s admission requirements is added to the index on the first month-end business date after its issuance, provided its issue date falls before the 15th of the month. A new issue whose issue date falls on or after the 15th of the month is added to the index on the last business day of the next month.

Index weighting methodology

The JACI Core’s bond allocation calculation process starts with each country’s current face amount of debt outstanding. The following inclusion schedule is applied to these amounts to determine the constrained amounts eligible for inclusion in the JACI Core. From each country’s total eligible debt stock, the JACI Core includes:

- 100% of the first US$11 billion of the eligible debt stock;
- 75% of the eligible debt stock that exceeds US$11 billion, but does not exceed US$22 billion;
- 50% of the eligible debt stock that exceeds US$22 billion, but does not exceed US$33 billion;
- 25% of the eligible debt stock that exceeds US$33 billion, but does not exceed US$44 billion;
- 10% of the eligible debt stock that exceeds US$44 billion, but does not exceed US$55 billion; and
- 0% of the eligible debt stock that exceeds US$55 billion

Determining instrument and country weights

Once these instrument allocations are derived for each country, the current settlement price for each instrument is applied to its JACI Core’s allocation to calculate the market capitalization of each issue in the index. The weight of each instrument in the JACI Core is then determined by dividing its market capitalization by the total market capitalization for all of the JACI Core’s instrument allocations. The result represents the weight of each issue expressed as a percentage of the JACI Core. By allocating their portfolios according to these exact instrument weights, and accounting for coupon reinvestments and index instrument allocation changes, investors can replicate the performance of the JACI Core. Country weights for the index are easily calculated by aggregating the weights of the instruments for all countries.

JACI Core country weight diversification and methodology will be reviewed annually.

Daily production of the JACI Core

The JACI Core is produced on every business day of the year. Business days are based on the US Bond Market calendar set by the Emerging Markets Traders Association (EMTA).

Pricing and conventions

Security level pricing in the JACI Core index is sourced from a third party valuation vendor ensuring transparency and consistency. The JACI Core instruments will be marked on the bid side for returns and durations while yields and spreads will use the offer side and they are taken at close of business. All FX spot and forward rates used for calculating hedged and unhedged foreign currency returns are supplied by WM Reuters at 4 PM London time. 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.

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1Effective June 23rd, 2014 PricingDirect Inc. will become the primary source for J.P. Morgan index bond prices. Please see www.pricing-direct.com for further details.

Early closes
When the US Bond Market closes early, typically before market holidays or when EMTA recommends an early close, prices of JACI Core instruments will be captured at the latest possible time to reflect an active closing market.
Appendix: Instrument and index total return calculations

The following is a description of our methodology for calculating returns (total, price, and interest returns). Section I describes single-instrument returns. Section II describes index total returns. Section III describes yields and spread calculations for single instruments and the index as a whole.

The total return calculation for a single instrument is a means of representing the economic benefit of holding the specific security. In its simplest form, it is based on the “cash in/cash out” notion—i.e., what is paid for the security at the initial purchase versus what is received at its sale. Of course, most fixed income securities pay some form of coupon along the way, and some pay amortizations. For the calculation of individual instrument total returns, this cash is reinvested in the instrument when received. However, when the instrument is part of a portfolio whose allocations are based on market capitalization (in the case of the JACI Core), the use of this market capitalization weighting scheme in effect causes this cash to be proportionately reinvested in the other instruments that make up the portfolio.

The means of calculating the total return on a basket containing various instruments is an extension of the single-instrument total return framework. To hold a “passive” portfolio, one would buy the instruments in the same proportions in which they comprise of the JACI Core. In the case of the JACI Core, each proportional amount is a function of both the amount of the instrument outstanding (based on publicly available information) and its settlement price. These two factors, when multiplied together, equal the asset’s market capitalization. The JACI Core uses the same approach, except the amount outstanding used is according to the debt allocation schedule.

I. Single-instrument return

The total return on a performing instrument is measured from one trade day to the next using the following generalized equation:

\[
tr_t = \frac{ESV_{s(t)} + C_{v(t)} + AM_{v(t)} \times \frac{FX_{i,t}}{FX_{i,t-1}}}{ESV_{s(t-1)}} - 1
\]

This equation captures the three main components of a fixed income asset’s value: price, cash flow (coupon and/or amortization) and currency. These components are represented by:

\[
ESV_{s(t)}
\]

Effective settlement value; primarily a function of the effective settlement price but also of the ex-coupon and ex-amortization rules [see equation (2) below]

\[
C_{v(t)}
\]
If applicable, the coupon payment to which a holder on trade date \( t \) is entitled on value date \( v(t) \); determined by the instrument structure, ex-coupon conventions, and holiday calendar

\[
AM_{v(t)}
\]

If applicable, the amortization to which a holder on trade date \( t \) is entitled on value date \( v(t) \); determined by the instrument structure, ex-amortization conventions, and holiday calendar

\[
FX_{t}
\]

Foreign currency exchange rate for currency \( i \) measured in US dollars per unit of foreign currency. Since the JACI Core currently contain only U.S. dollar-denominated instruments, currency does not contribute to the indices’ daily returns.

\( t \)  
Trade date; all index instruments trade on a New York holiday calendar

\( v(t) \)  
Value date for trade date \( t \); date used to calculate accrued interest, which usually, but not always, coincides with the settlement date

\( s(t) \)  
Settlement date for trade date \( t \); date on which cash transaction occurs

The effective settlement value can be calculated as follows:

\[
2. \quad ESV_{s(t)} = ESP_{s(t)} + XC_{v(t)} + XAM_{v(t)}
\]

where:

\[
ESP_{s(t)}
\]

Effective settlement price, which is the price paid for a bond that is traded on trade date \( t \) and settled on settlement day \( s(t) \). The settlement date is determined by the settlement convention of the bond and holiday calendar for the settlement convention; in short, the amount of money, including accrued interest, etc., owed at the settlement date.

\[
XC_{v(t)}
\]

Ex-coupon placeholder; in some markets, market convention designates a date that begins an “ex-period,” ending on the coupon payment date, during which a seller of the bond is entitled to keep the upcoming coupon. This ex-period is usually 30 days. In effect, the coupon is stripped from the bond, such that the current buyer is no longer buying the rights to the coupon, and therefore the ESP paid by the buyer should be reduced by the amount of the foregone coupon. For the total return, however, it is imperative to maintain the continuity of the traded asset – i.e., the bond should be “reconstituted” to its cum-payment before the ex-structure. To do this, we
account for the value this coupon represents to the seller via an ex-coupon placeholder. Intuitively, the placeholder is an amount representing the value of the next coupon discounted to the settlement date of the transaction and is calculated as:

\[
xc_{t}(t) = \frac{C}{(1 + L_t)^{360}}
\]

- **C**: Coupon amount to be paid at the end of the ex-period
- **Lt**: One-month Libor, used as the cash rate for the discounting
- **ds,t**: Number of days from settlement to the next coupon

The ex-coupon and ex-amortization placeholders are carried in both the numerator and the denominator of the total return formula and effectively cease to exist when the ex-period elapses.

Although this equation is sufficient for the generalized concept of total return, complexities stem from the determination of the effective settlement price and the treatment of interim cash flows. Therefore, below we describe the differences between instrument types, then show how these differences are incorporated into the generalized equation.

**Effective settlement prices, ESPs(t)**

Effective settlement price is the instrument’s settlement “price”—i.e., the amount of money owed at settlement. ESP calculations translate the quoted price into this settlement price, taking into account appropriate quotation conventions and settlement practices.

The quotation and settlement of USD-denominated bonds in the emerging markets currently follow guidelines set by two different groups. Brady bonds and Eurobonds follow standard international settlement, set by the International Securities Markets Association (ISMA). Price quoting conventions are overseen, but not set by, the Emerging Markets Traders Association (EMTA); EMTA members also agree upon trading and settlement practices for loans.

There currently are two settlement practices used for instruments in the JACI Core: standard international settlement and loan settlement. The standard international settlement period was seven calendar days through June 1, 1995, and became three business days on June 7, 1995. Loan settlement follows an EMTA prescribed “batch settlement” process, whereby trades executed during specified time periods all settle on single pre-determined settlement dates.
Two types of price-quoting distinctions apply: the clean versus dirty pricing convention and the current versus original face pricing convention.

**Clean versus dirty quote conventions**
The clean-dirty distinction refers to whether an instrument’s quoted price is inclusive of accrued interest or not. Since the effective settlement price refers to all money paid at settlement, if a bond is quoted clean, the accrued interest through the value date owed at settlement must be added to the instrument’s price.

**Current face versus original face value quote conventions**
The current face-original face value distinction applies to amortizing and capitalizing bonds; it refers to whether a bond’s quoted price is for a current face amount of 100 or for the original face value of the bond, which may reflect the fact that the instrument has amortized to an amount less than 100 or has capitalized to an amount greater than 100. Since effective settlement price refers to the money actually paid at settlement, which is based on the current outstanding face value of the bond, an adjustment is made to the bond’s quoted price on a current-face basis to adjust it to an original-face basis. Exhibit 8 shows the pricing conventions of instruments in the JACI Core.

For example, a bond that is trading at par but has just amortized 10% would trade at a price of 100 on a current-face basis, but at a price of 90 on an original-face basis. Also, a bond that is trading at par and has just capitalized 10% would trade at 100 on a current-face basis and 110 on an original-face basis.

The adjustment from a current-face to an original-face basis is achieved by using a “balance” scalar, $B_v(t)$, which keeps track of the remaining balance of a bond after capitalizations and amortizations. For bonds that have amortized from par, the balance scalar will be between 0 and 1, starting at 1 at issue and decreasing to 0 at the final amortization (maturity) of the bond. For bonds that capitalize, the number rises starting at 1, as determined by the capitalization rates of the bond. This balance scalar strictly follows the quoting conventions of a bond and is not necessarily related to the balance of outstanding bonds as tracked by an issuer.

For example, in the case of bonds that trade with an ex-period for amortizations, the “ex-balance” follows the same convention. If the bond goes ex-amortization 30 days before the coupon, on that date the seller retains the right to the coupon; therefore, the effective settlement price is lowered (jumps down) by the amount of the amortization, since the buyer is no longer entitled to it. For a bond trading on a current-face basis, this adjustment at settlement is made via the $B_v(t)$ scalar. This scalar is an important variable because it adjusts other variables affecting the effective settlement price. Accrued interest, for example, is normally computed on a cash basis (i.e., coupon rate x day count), ignoring the current balance of the bond. Here, again, the scalar is used to adjust the accrued interest for the balance on the bond.

Because the balance scalar is determined independently (i.e., it is based solely on the cash flow structure and quoting conventions for the bond), it can be used to scale all other variables. The remainder of this description assumes that all non-price variables have been appropriately adjusted and, therefore, defined on an original-face basis.
With these concepts in mind, we can generalize the equation for the effective settlement price of performing instruments as follows:

\[
3. \quad ESP_{s(t)} = b_P \times \begin{cases} 
0, & \text{if } CO = 1, B_{v(t)}, \text{if } CO = 0, 1 \\
+ CO \times AC_{v(t)} \times b_P + CD \times AI_{v(t)} 
\end{cases}
\]

where:

- \( b_P \) = Bid price of a bond according to the quoting conventions of the bond’s market; total return is calculated on the bid side so as to represent the “cash out” value of the bond on a given day.

- \( CO \) = Current face/original face value indicator:
  - 1 = Bond quoted on a current-face basis (i.e., needs scaling if applicable); and
  - 0 = Bond quoted on an original-face value basis.

- \( Bv(t) \) = Face balance scalar used to adjust for principal balance due, as determined by the cash-flow structure, and settlement and ex-balance conventions.

- \( ACv(t) \) = Accrued capitalization; for bonds that capitalize and are quoted on a current-face basis, an adjustment is made at settlement for the portion of the next capitalization that is not included in the quoted price. Since capitalization is a payment for principal (unlike accrued interest, which is a payment for interest), the accrued capitalization, \( AC \), is multiplied by the quoted price; \( AC \) is determined analogously to accrued interest (i.e., capitalization rate x day count convention).

- \( CD \) = Clean/dirty indicator:
  - 1 = Bond quoted on a clean basis; and
  - 0 = Bond quoted on a dirty basis.

- \( AIv(t) \) = Current period’s coupon rate x day count convention; this is calculated up to, but excluding, the value date, \( v(t) \). Although conventions covering accrued interest calculations can be generalized, exceptions do apply.

### Settlement and interest calculations

JACI Core calculations take into account accrued interest conventions, settlement conventions, and ex-coupon/ ex-amortization conventions of each security and market.

### Day-count basis

In general, the day-count basis will depend on whether a bond has a fixed or floating rate. For fixed-rate bonds, it is usually 30/360, and for floating-rate bonds, it is usually either actual/360 or Treasury actual/actual. Exceptions exist, which apply to certain Brady bonds.

### Coupon payment

Depending upon the specific debt instrument, coupons can be scheduled monthly, quarterly, semiannually, or annually. How the coupon end-of-period and pay dates...
are set vary from bond to bond. Several conventions apply to situations in which the end of a coupon’s period falls on a weekend or holiday, as defined by EMTA. These conventions are detailed in Table 6.

**Table 6: End-of-period conventions**

| If a scheduled end-of-period (EOP) date falls on a weekend or holiday, the end of period: |
|---------------------------------|---------------------------------|
| EOP/Pay 1 | Remains on that date, and the actual pay date is moved to the next business day |
| EOP/Pay 2 | And the actual pay date are moved to the next business day |
| EOP/Pay 3 | And the actual pay date are moved to the next business day, unless that pushes them to the next calendar month, in which case they are moved to the preceding business day |
| EOP/Pay 4 | And the actual pay date are moved to the next business day, and all subsequent ends of periods are benchmarked from that day |
| EOP/Pay 5 | All hybrid cases of 1 through 4 |

**Coupon accrual**

Generally, interest accrues from the previous coupon date (inclusive) to the settlement date (exclusive). If a bond trades ex-coupon, negative accrued interest will accrue from the ex-date to the coupon date.

**Cash reinvestment**

Since coupon income and amortization payments on performing instruments are reasonably certain, reinvestment is done on the date on which the value date for the trade captures the next cash payment. This allows the investor to affect the reinvestment trade such that, when the trade settles, the cash payment is available.

**Price and interest return**

Price return is the component of total return that follows just the price movement. Intuitively speaking, it is the original-face, clean-priced bond’s return, \( P_t(o,c) \). This bond’s return is calculated using variables already defined:

\[
4. \quad P_t^{o,c} = b_p^o \times \left\{ \begin{array}{ll}
\text{if } CO = 1, & B_{v(t)} \\
\text{if } CO = 0, 1, & CO \times AC_{v(t)} \times b_p^o \\
\end{array} \right.
\]

\[
+ \quad xam_{v(t)} \times \left\{ \begin{array}{ll}
\text{if } CD = 0, & A_{v(t)} \\
\text{if } CD = 1, 0, & \end{array} \right.
\]

Price return, adjusted for currency, then is:

\[
5. \quad Pr_t = \frac{P_t^{o,c} + \text{AM}_{v(t)} \times FX_{i,t}}{P_{t-1}^{o,c} \times FX_{i,t-1}} - 1
\]

Finally, interest return is simply a residual of total return and price return:

\[
6. \quad 1 + \text{ir}_t = \frac{tr_t + 1}{Pr_t + 1}
\]

**Treatment of non-performing instruments**

In the event of an unexpected delay of or default on a payment, the specific cash flow would not be recognized until the payment is actually received. The calculation of an
individual non-performing instrument’s return and the resulting index return would follow the settlement-cash flow entitlement convention set by either EMTA or a similar market trade group.

A default will FORCE the removal of the affected instrument from the JACI Core. The issue will be removed on the month-end after the 30 day grace period unless there is an official documentation claiming a moratorium. If official documentation is available the instrument will be removed at the month-end during the rebalancing period.

II. Index total return

To compute a daily index value, we need to know the following:

1. The list of instruments to be included and their amounts outstanding;
2. The daily total return of each instrument; and
3. The weight of each instrument as of the prior business day’s close.

The first factor, the list of instruments and amounts outstanding, comprises parameters that are exogenous to the other factors and, therefore, changes to it should not result in changes in value of the index. These “rebalancing” events are done to the index on the last business day of each month, such that the index’s next month’s composition reflects the new instrument balance. When a rebalancing event occurs, it is as if the investor sells the entire portfolio at the day’s closing bid-side prices, and then immediately reinvests the proceeds in the new portfolio in proportion to the new market values based on the same closing bid-side prices. This results in a shift in the relative weights but not a change in the overall portfolio value.

It is worth noting what is meant by the amount outstanding of an instrument. Recall that amortizations and capitalizations, where applicable, result in changes to the amount outstanding. These changes are “passive,” however, and are already captured in the effective settlement price via the balance scalar. Therefore, the figure used in determining market value is the original amount outstanding, plus or minus any “active” changes to the amount outstanding resulting from reopenings or buybacks (which we will refer to as N, the “number of bonds”). Since this is an original-face value concept, it is consistent with all our other variables, also defined in terms of original face value.

The total return on day t, TRt, is the arithmetically weighted average of each instrument’s return from the period t-1 to t. The weights are market-capitalization weights from the prior business day, t-1:

\[
TR_t = \sum_{i \in L(t')} m_{i,t',t-1} \times tr_{i,t}
\]
In this equation, the “ith” bond’s dirty market-capitalization weight on day t-1 is defined by:

\[
m_{i,t',t-1} = \frac{N_{i,t'} \times ESV_{i,s(t-1)}}{\sum_{i \in L(t')} N_{i,t'} \times ESV_{i,s(t-1)}}
\]

where:

\[
\sum_{i \in L(t')} m_{i,t',t-1} = 1
\]

and:

- \(L(t')\) Instrument list on day \(t'\)
- \(t'\) Last rebalancing day
- \(N_{i,t'}\) Number of bonds (see above); usually equal to the amount outstanding, except for capitalizing or amortizing bonds

Each term in the summation in Equation 7 measures the percentage contribution of an instrument to the change in the index portfolio’s value between day t-1 and day t.

Since each instrument’s weight is updated daily, it is possible to see how cash reinvestment is done. Because the effective settlement price of an instrument drops concurrently with its cash payment (the accrued interest, balance scalar, quoted price, or cash-promised variable drops, depending on the type of instrument), the instrument’s market-capitalization weight drops, raising the relative importance of the other instruments within the portfolio. This achieves cross-index reinvestment. Since the scheduled cash flow causes the instrument’s market capitalization and weight as a percentage of the index to drop, a simultaneous increase in the weight of the other instruments in the index occurs. As a result of this shift in instrument weights, from a mathematical perspective cross-index investment of the cash flow is achieved.

Once the aggregate daily total return of the JACI Core is known, it is then applied to the index’s prior day closing level to arrive at the current day’s closing value:

\[
I_t = I_{t-1} \times (1 + TR_t)
\]

\(I_{t-1}\) The closing cumulative total return index level for the JACI Core as of the prior business day (where December 31, 2001 = 100)

**Price and interest return**

All of the variables needed to calculate index price returns are defined above, except for one. This remaining variable represents the clean market capitalization, which is computed in an analogous way to the dirty market capitalization, but uses the clean-price concepts described earlier for bonds and loans, instead of the effective settlement price. Therefore, portfolio price return is the weighted average—in which the weights are clean—of the price returns of the constituent instruments. Interest return calculations continue to be based on the same formula.
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