31 January 2019

J.P. Morgan Asia Credit Index Prime

Index Methodology and Profile

Highlights

The J.P. Morgan Asia Credit Index (JACI) Prime aims to track the performance of eligible US Dollar-denominated bonds issued in the Asia excluding Japan region with a minimum notional outstanding of US$500 million and a minimum maturity of 2 years. Bonds issued by corporate, sovereign and quasi-sovereign issuers are eligible for the index.

The JACI Prime is based on the composition and established methodology of the J.P. Morgan Asia Credit Index (JACI), which is market capitalization weighted. The rules and methodology document for the parent index is available here.

Index Criteria

Country/Region	Asia ex-Japan
Issuer	Corporates, Sovereign and Quasi-sovereign
Instrument Type	Fixed, floaters, amortizers and capitalizers are eligible
Maturity	**For entry:** at least 2.5 years until maturity
	Remaining maturity: at least 2 years
Amount Outstanding	Issues must have minimum $500 million notional outstanding to be eligible
Currency	US Dollar denominated
Default Treatment	Defaulted bonds are excluded
Liquidity Criteria	Daily available pricing from PricingDirect[1]
Jurisdiction	International Law

Index Characteristics and Methodology

Holiday	Follows U.S. bond market calendar set by Emerging Markets Trader Association (EMTA)
Pricing	Bid and Ask prices are taken from a third party pricing source (PricingDirect)
FX Rates	All FX rates are as of 4pm London time provided by WM Reuters
Coupon Treatment	Immediately reinvested back into the index
Rebalance Date	Last U.S. business day of the month
Rebalancing	Rebalances on the last working day of the month. If FX rates from WM Reuters are unavailable on the last weekday of the month (i.e. Good Friday), indices are rebalanced on the previous business day.

[1] **PricingDirect Inc.**, a market-based professional valuation service and a wholly owned subsidiary of JPMorgan Chase & Co, is utilized as the primary source for instrument level pricing ensuring transparency around pricing sourcing and consistency/accuracy of index constituent valuations.

Defining the universe of JACI Prime instruments

The J.P. Morgan Asia Credit Index (JACI) Prime provides investors with a benchmark that tracks US Dollar-denominated debt instruments in the Asia ex-Japan region. Eligibility for issues is determined using the following criteria:

Instrument Type

The index 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 index contains only those bonds or loans issued by sovereign, quasi-sovereign and corporate entities from index-eligible countries. As per the J.P. Morgan Index definition, an entity that is 100% guaranteed or 100% owned by the national government, and resides in the index eligible country qualifies as 'quasi-sovereign'. Instruments issued by municipalities or provinces are eligible for index 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 Prime, 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 index, if the underlying loan or bond is not itself included in the index.

Currency Denomination

Only bonds denominated in US Dollars are considered for inclusion.

Amount Outstanding

Only bonds with a current face amount outstanding of US$500 million or more will be considered for inclusion.

Time to Maturity

Only bonds with at least 2.5 years to maturity are considered for inclusion. Once added, an instrument may remain in the index 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 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 Convention

Instruments in the JACI 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 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

Bonds must have bid and offer prices available on a daily and timely basis from our third party evaluation vendor, PricingDirect, to be considered for inclusion. The lack of availability of such prices prevents the addition of a new issue to the index. In the case of the current JACI 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 index'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.

If an announcement is made for a bond to be called, it is removed the month-end prior to its call date on the basis of having less than 24 months remaining until maturity. If an announcement is not made in time for the bond to be removed the prior month-end, it will be removed the first month-end following the announcement.

Index Profile, Characteristics and Returns

- As of December 31st, 2018, the JACI Prime contains 789 bonds.
- The average index yield is 5.35% (yield to worst of 5.02%) with an average modified duration of 5.18 years.

Figure 1: Summary of Country Weight Exposure

Country	Weight (%)
China	48.16
Hong Kong	7.60
Indonesia	13.69
India	5.68
Korea Republic Of	8.30
Sri Lanka	1.43
Mongolia	0.54
Macau	1.35
Malaysia	3.06
Philippines	4.81
Pakistan	0.76
Singapore	3.18
Thailand	1.05
Taiwan Province Of China	0.25
Vietnam	0.16

Source: J.P. Morgan, as of Dec 31st, 2018

Figure 2: Monthly return (%, USD) of the JACI Prime Index, 2013- 2018:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual/ YTD
2013	-0.77	0.66	-0.10	1.64	-2.54	-4.00	0.95	-2.11	2.33	2.44	-0.69	-0.25	-2.63
2014	0.79	1.73	0.56	0.75	2.34	0.16	0.75	1.17	-0.97	1.27	0.72	-0.33	9.29
2015	1.83	-0.02	0.62	0.49	-0.25	-1.00	0.41	-0.80	-0.16	1.76	-0.12	-0.37	2.37
2016	1.28	0.63	2.10	0.79	0.28	2.02	1.63	0.82	0.16	-1.03	-2.44	-0.25	6.05
2017	0.93	1.56	0.22	0.53	0.60	0.23	0.59	1.03	-0.07	0.47	-0.21	0.17	6.19
2018	-0.67	-1.11	0.01	-0.80	0.10	-0.48	0.91	0.52	-0.24	-1.37	0.54	1.52	-1.10

Source: J.P. Morgan

Where to find the JACI Prime Index?

Bloomberg Ticker	JPEIPRIM
DataQuery	DB(SAGE,JACI_PRIME,AM_IDX_TOT)
Morgan Markets	www.jpmm.com
	Research → Index → J.P. Morgan Asia Credit Index (JACI)

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.

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:

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

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
$FX_{i,t}$	Foreign currency exchange rate for currency *i* measured in US dollars per unit of foreign currency. Since the JACI 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. $$ESV_{s(t)} = ESP_{s(t)} + xc_{v(t)} + xam_{v(t)}$$

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:

$$xc_{v(t)} = \frac{C}{(1+L_t)^{\frac{d_{s,t}}{360}}}$$

C	Coupon amount to be paid at the end of the ex-period
L_t	One-month Libor, used as the cash rate for the discounting
$d_{s,t}$	Number of days from settlement to the next coupon
$xam_{v(t)}$	Ex-amortization placeholder; this concept is completely analogous to the ex-coupon placeholder and is calculated in the same way: $xam_{v(t)} = \frac{AM}{(1+L_t)^{\frac{d_{s,t}}{360}}}$

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.

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.

We can generalize the equation for the effective settlement price of performing instruments as follows:

3. $$ESP_{s(t)} = bp_t^Q \times \{if\ CO = 1, B_{v(t)}, if\ CO = 0, 1\} + CO \times\ AC_{v(t)} \times CD\ \times AI_{v(t)}$$

Where:

bp_t^Q	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
$B_{v(t)}$	Face balance scalar used to adjust for principal balance due, as determined by the cash-flow structure, and settlement and ex-balance conventions
$AC_{v(t)}$	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
$AI_{v(t)}$	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 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 Figure 3.

Figure 3: 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 is moved to the next business day.
EOP/Pay 3	And the actual pay date is 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 is 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, *Pt(o,c)*. This bond's return is calculated using variables already defined:

4. $$p_t^{O,C} = bp_t^Q \times \{if\ CO = 1, B_{v(t)}, if\ CO = 0,1\} + CO \times AC_{v(t)} \times bp_t^Q + xam_{v(t)} - \{if\ CD = 0, AI_{v(t)}, if\ CD = 1,0\}$$

Price return, adjusted for currency, then is:

5. $$Pr_t = \frac{p_t^{O,C} + AM_{v(t)}}{p_{t-1}^{O,C}} \times \frac{FX_{i,t}}{FX_{i,t-1}} - 1$$

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

6. $$1 + ir_t = \frac{tr_t + 1}{Pr_t + 1}$$

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 and JACI Prime. 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

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:

7. $$TR_t = \sum_{i \in L(t')} m_{i,t',t-1} \times tr_{i,t}$$

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").

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:

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

$L(t')$	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 is known, it is then applied to the index's prior day closing level to arrive at the current day's closing value:

8. $$I_t = I_{t-1} \times (1 + TR_t)$$

Where:

I_{t-1}	The closing cumulative total return index level for the JACI 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 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.

III. Yield and spread calculations

Instrument level yield

Blended Yield to Maturity is simply the internal rate of return of the bond instrument. Stripped Yield measures the pure issuer risk by stripping out any collateralized cashflows from the instrument. In the case for uncollateralized bonds the blended yield is equal to the stripped yield. Stripped Yield is usually referred to as Sovereign Yield for the Emerging Markets sovereign bonds and the EMBI indices.

Embedded options are ignored for Yield to Maturity calculations

Instrument level spread

Spread measures the credit risk premium over US Treasury bonds. The Blended Spread is the regular Spread over Treasury. Spread over Treasury is simply the difference between the Yield to Maturity Bond and the Yield to Maturity of the corresponding point on the US Treasury spot curve. Since Yield to Maturity is simply the discount rate at which all present value of all future cashflows equals the market price of the bond, all cashflows are discounted at the same (flat) rate.

Composite level yields and spreads

The calculation methodology for index level yields and spreads are the same as the instrument level. Cashflows from all the individual bonds in the portfolio are added up to create a single "superbond". The yield and spread for this "superbond" is then calculated as described above for the single instrument. Note that the result will be different from the market capitalization weighted spread derived from individual bonds in the portfolio.

IV. Other Index metrics

Effective Interest Rate (EIR) duration: Measure of sensitivity of dirty price with respect to the US interest rates parallel shift. It approximately shows the percentage change of dirty price if all US interest rates change by 100bp.

Effective spread duration: Measure of sensitivity of dirty price with respect to the sovereign spread movement. It approximately shows the percentage change of dirty price if stripped spread changes by 100bp.

Average life: Weighted average time of principal repayment. For non-amortizing bonds, the average life of the bond is equal to the years to maturity.

V. Credit quality

J.P. Morgan categorizes and calculates analytics on nine distinct credit buckets: Investment Grade, non-investment grade, AAA, AA, A, BBB, BB, B, C and NR (non-rated) sub-index. Where we publish index statistics for ratings-based sub-indices, we take the middle rating of Moody's, S&P and Fitch ratings. Where only two ratings are available, we use the lower of the two ratings to determine an instrument's ratings category.

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