CREDIT SUISSE

Credit Suisse Bond Index Methodology and Guidelines

April 25, 2018

Introduction

The Credit Suisse Global Index and Alpha Strategies group offers a set of benchmark indices that allow investors to perform relative value analysis and track market performance, as well as a comprehensive family of cross-asset tradable indices that provide access to algorithmic and customized strategies.

The comprehensive family of benchmark fixed income indices tracks all asset classes of the global fixed income markets and provides aggregate and bond-level data that are both consistent and objective. The team also builds bespoke tradable indices leveraging the strategies and analytical capabilities of various Credit Suisse groups and offers a wide array of high quality, complex, and innovative investable products as well as a flexible framework that allows for streamlined new index creation.

Credit Suisse benchmark bond indices cover government bonds, investment grade and high yield credit, as well as emerging markets. A major factor differentiating Credit Suisse credit indices from other indices is a focus on liquidity. Our robust selection of the most actively traded issues on the market based on rule inclusion ensure our indices provide an excellent representative view of various segments of the market.

This document is intended as a reference guide to calculations of key measures that apply to Credit Suisse benchmark bond indices. It is important to note that there are some measures calculated for specific indices that may not be included here.

This document is not intended to address index-specific inclusion or weighting criteria, but rather is focused on measures that are calculated on a daily basis. It is recommended that clients consult the specific rule books for the indices they may be interested in and then refer to this piece for a general overview of calculations and analytics.

The measures outlined in this document can be aggregated using our Index Workbench technology. Please contact a member of the index team for a demo or assistance with using the Workbench.

Please contact the author(s) for further information regarding the guidelines or the Quantitative Strategies contributor(s) / list.fiindexcredit@credit-suisse.com for a demo or assistance with using the Credit Suisse's Bond Index Methodology and Guidelines.

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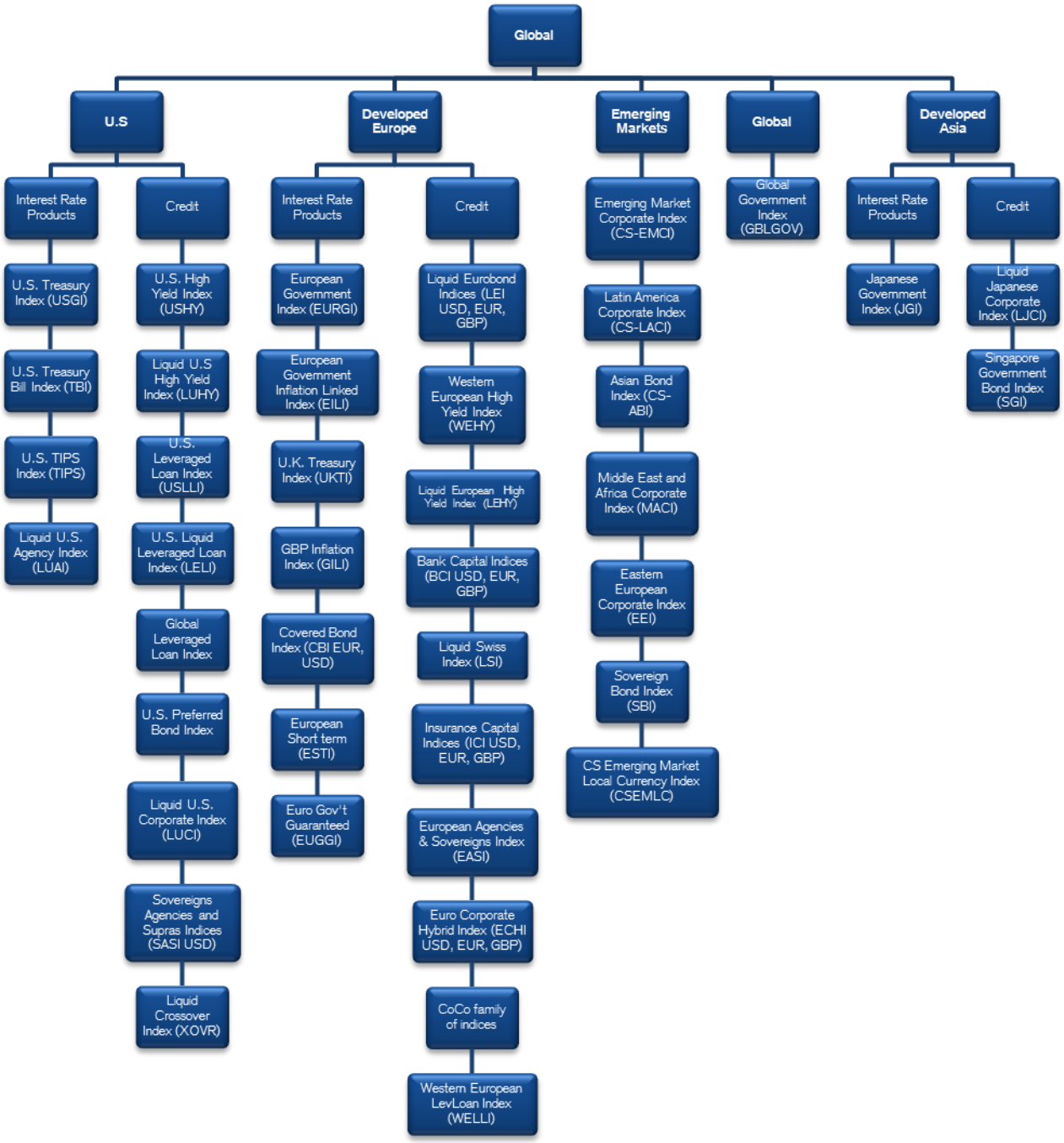
As part of our commitment to provide our clients with the most innovative and effective index products available, Credit Suisse has developed the following suite of fixed income bond indices:

Figure 1: Credit Suisse suite of Fixed Income Indices



Index Methodology

The price of each bond in Credit Suisse indices is sourced from a variety of reputable pricing vendors. As opposed to alternatives such as matrix pricing, this pricing approach provides more timely and reliable pricing information and enables clients to conduct their own relative value and portfolio performance analysis to accurately gauge market trends and conditions.

Current and historical data for Credit Suisse's benchmark bond indices are available online via a user-friendly Workbench aggregation platform, which allows for customized reporting and in-depth analysis. Clients can access aggregate and sub-index data across any combination of ratings, maturities, and industry sectors and generate reports tailored to specific benchmarking needs. All reports can be saved and updated automatically or downloaded to an Excel spreadsheet.

The Index and Alpha Strategies team calculates the change in all measured characteristics for each index on a daily basis. Measures are also calculated at the sub-index and bond-level. Market capitalization weighting is used for all index characteristics, excluding average price and average coupon, which use principal outstanding. Market cap index weights are frozen at the end of the previous month or daily fluctuating for forward-looking measures (see below).

All Credit Suisse index formulas ignore transaction costs and tax consequences. Indicative bid prices are used for most of the index calculations, in exception of some high yield indices which use mid prices. Updates to the bond-level composition are made on the first business day of each month. For further information on the inclusion criteria and other index details, please consult the individual index introductory documents, which are accessible via Credit Suisse Plus.

Key Definitions:

Index Sponsor: Credit Suisse International (the "Index Sponsor")

Index Calculation Agent: Credit Suisse International (acting through its Quantitative Strategies Department[1])

Index Committee: A committee whose membership comprises senior management within The Index Sponsor, which has responsibility for these Index Rules.

Index: For the purposes of this document, "the Index" refers to any Credit Suisse bond index which is determined in accordance with this methodology document.

Index Rules: In respect of an Index, the rules governing the calculation of such Index, comprising this methodology document as supplemented by any Index-specific parameters include, without limitation, the bond inclusion criteria.

Rebalance Date: Last business day of the month, on which index constituents for the upcoming month are solidified.

Index Calculation Day: Days on which Index levels and measures will be calculated (includes all business days other than those designated as Index Holidays by a holiday calendar relevant to the specific index).

Denomination Currency: Currency in which bonds in the index are denominated.

[1]The Quantitative Strategies Department of Credit Suisse International is independent of the sales and trading activities of the firm. CSI has policies in place to ensure the independence of the Quantitative Strategies department when carrying out the activities described in this document and to manage potential conflicts of interest.

The following section provides additional details on Credit Suisse's index calculations and methodology, including:

Measures	Market Cap Weighting Type
Returns (total, price, and excess)	Frozen
Yields (to-next, to-maturity, to-worst, annual, semi-annual)	Fluctuating
Duration (Macaulay, Modified)	Fluctuating
Convexity	Fluctuating
Swap Spreads	Fluctuating

Return Measures

Three basic equations are used for calculating index- and bond-level returns: total return, price return, and interest return. Total return is the sum of the price and interest return. If daily returns are known, users can calculate returns for any given period. All accrued values are accumulated up to the settlement date (T+3) for corporate bonds and (T+1) for government bonds. The following assumptions are used:

Unless otherwise noted, "returns" refers to daily returns.

0 : is the last business date of the previous month, also called "date0"

T : is the current date, i.e., today

t_{-1} : is one business date before today, also called "yesterday"

Pc_t : today's clean price

Pc_0 : date0's clean price

Pc_{t-1} : yesterday's clean price

Pd_{t-1} : yesterday's dirty price

Pd_0 : date0's dirty price

Pd_t : today's dirty price

PR_t: today's price return

AI_t : Accrued interest, as a percentage of par, for today

AI_{t-1}: Accrued interest, as a percentage of par, for yesterday

$CF_{0,t}$: coupon cash flow between date0 and today

$CF_{0,t-1}$: coupon cash flow between date0 and yesterday

$IC_{0,t}$: cash received between date0 and today including coupon reinvestment

$IC_{0,t-1}$: cash received between date0 and yesterday including coupon reinvestment

$DCT_{0,t-1}$: days between coupon date and yesterday where coupon date is between date 0 and yesterday

$DCT_{0,t}$: days between coupon date and today where coupon date is between date0 and today

Rt_0: LIBOR 1M at date 0.

Total Returns

The total return calculated on most performing bonds, from the last business date, for example, 0 to date t, is defined as:

$$TR_{0,t} = \frac{Pc_t - Pc_0 + AI_t - AI_0 + IC_{0,t}}{Pd_0}$$

The total return from the last business date 0 to the date before t (t-1) is defined as:

$$TR_{0,t-1} = \frac{Pc_{t-1} - Pc_0 + AI_{t-1} - AI_0 + IC_{0,t-1}}{Pd_0}$$

While the above formula applies to most bonds in Credit Suisse indices, there are a few exceptions (explained below).

Non-Performing Bonds

Non-performing bonds are considered to be bonds that are flat-trading, defaulted, or otherwise no longer accruing interest. If a bond fails to make a coupon payment it is immediately set to non-performing, regardless of the grace period. The total return calculated on a non-performing bond from the last business date (0 to date t, for example) is defined as:

$$TR_{0,t} = \frac{Pc_t - Pc_0 - AI_0 + IC_{0,t}}{Pd_0}$$

Where:

AI_0 is the calculated accrued interest based on whether or not the bond was performing at the start of the month.

If the bond was not performing at the beginning of the month, the value is 0. If the bond was performing at the beginning of the month, then AI_0 will contain the accrued interest as normally calculated on that date.

If a payment is made during the grace period, then the bond will no longer be considered non-performing as of the payment date. On the date of payment, returns will immediately begin calculating using the standard total returns formula:

$$TR_{0,t} = \frac{Pc_t - Pc_0 + AI_t - AI_0 + IC_{0,t}}{Pd_0}$$

Where:

AI_0 is set to 0 if the bond was non-performing at the beginning of the month;

$IC_{0,t}$ contains cash in the amount of the coupon payment that was made before the grace period.

Amortizing Bonds

For the calculation of total returns on performing bonds with sinking funds, the factor of the bond on day t as well as the factor of the bond on the last business day of the previous month is considered as follows:

$$TR_{0,t} = \frac{Pc_t \times F_0 + AI_t \times F_t - (Pc_0 + AI_0) \times F_0 + IC_{0,t}}{(Pc_0 + AI_0) \times F_0}$$

Where:

F_0 is the factor on the last business day of the previous month;

F_t is the factor on the current business day.

The one-day total return in percentage between dates t-1 and t is:

$$TR_{t-1,t} = \left(\frac{1 + TR_{0,t}}{1 + TR_{0,t-1}} - 1\right) \times 100$$

Price Return

The price return is based on the clean price appreciation over yesterday's dirty price:

$$PR_t = \frac{Pc_t - Pc_{t-1}}{Pd_{t-1}}$$

Interest Return

There are two components to the interest return calculation: accrued interest appreciation and the reinvestment of the coupon during the period. The time between coupon payments on a bond is referred to as the coupon period. At any time during a given coupon period, the bond seller is entitled to the portion of the next coupon payment (known as "accrued interest") proportionate to the time elapsed since the prior payment. The quoted price of a bond does not normally take accrued interest into account. This is referred to as the "clean price." A quoted price which includes accrued interest is called the "dirty price".

The reinvestment rate is based on the USD 1M LIBOR rate as of the last business date of the previous month. The cash received during date0 and any given date during the month assumes that there are coupon payments during the period and that the reinvestment rate is applied to the actual number of days between the coupon payment date and the given date. If there is no coupon payment during the period, the IC component is set to 0, where:

$$IC_{0,t-1} = CF_{0,t-1} \times \left(1 + DCT_{0,t-1} \times {}^{Rt_0}/_{360}\right)$$

$$IC_{0,t} = CF_{0,t} \times \left(1 + DCT_{0,t} \times {}^{Rt_0}/_{360}\right)$$

Excess Return

Two types of excess returns are calculated for each fixed bond: excess return over benchmark and excess return over the asset swap asset, referred to as ExBench Returns and ExSwap Returns, respectively.

The "asset swap" asset is the floating bond associated with a given fixed bond, which has the same leg as the fixed bond. The dirty price of the asset swap asset uses a zero curve to discount all future cash flows to present values. The curve is defined by a swap curve as of the respective market close from Credit Suisse's pricing sources. As soon as the price for the asset swap asset is known, the total return of the asset can be calculated accordingly.

Return performance is measured against the benchmarked treasury bond and the asset swapped bond for each corporate security. These returns are also available by the highest- level aggregate level and the individual industry, maturity, and ratings sectors. These measures are called excess return over benchmarks and excess return over swaps and are market cap weighted.

Excess return period measures include 1Day (1D), Month to Date (MTD) Quarter to Date (QTD), and Year to Date (YTD) Excess Returns over benchmarks and swaps.

In the Workbench application, these measures are referred to as ExBench Total Ret and EXSwapTotal Ret. Daily price and total returns are calculated for excess returns over benchmarks. Total returns are calculated for excess returns over swaps. The formulas are as follows:

ExBench Price 1D return = fixed bond price 1D return - benchmark price 1D return

ExBench Total 1D return = fixed bond total 1D return - benchmark total 1D return

ExSwap Total 1D return = fixed bond total 1D return - asset swap bond total 1D return

Daily returns are aggregated to determine MTD, QTD, and YTD returns.

Period Excess Returns

For one-day returns, horizontal returns are derived using the following formula. Assuming T_s and T_e are the start date and end date of the period, the 1Day return for date T_i is R_{Ti}, where $T_s <= T_i <= T_e$.

The period return **R** can be represented as:

$$\boldsymbol{R} = \prod_{T_i=T_s}^{T_i=T_e} \left(1 + \frac{R_{T_i}}{100}\right)$$

Duration Adjusted Excess Returns

A duration adjustment is applied to the benchmark government bond in order to allow for a more accurate comparison of excess returns.

Excess Return = Total Return – ((Bench Total Return/Bench Duration) x Mod Duration)

FX Returns

Unhedged FX Returns

FX Unhedged Return is the return of a bond expressed in another currency:

$$(1 + MTDReturn) \times \left(\frac{FXRate_t}{FXRate_0}\right) - 1$$

Hedged FX Returns

FX Hedged Return is the return of a bond expressed in another currency plus the gain or loss on a hedge of that currency entered into on Day 0 using an FX Forward Contract:

$$\left[(1 + MTDReturn) \times \left(\frac{FXRate_t}{FXRate_0}\right) - 1\right] + \left[\frac{FXRate_0}{FFRate_0} - \frac{FXRate_0}{FXRate_t + \left(\frac{D-d}{D} \times (FFRate_t - FXRate_t)\right)}\right]$$

Benchmark Bond Determination

Benchmark bonds are determined for nearly all bond indices with the primary exception being government bond indices denominated in G10 currencies.

The determination of the benchmark bond is based on the trading conventions in the relevant bond market. These conventions are not set in stone and may change over time. Credit Suisse reassesses the market conventions periodically and adjusts the logic for determination of benchmarks accordingly in each market.

As of the publication of this document, the following conventions apply for determining the benchmark bond:

Emerging Market Corporate Bonds

Credit Suisse's suite of Emerging Market Corporate Bond indices are all USD denominated. On 1 January, the benchmark level to use for each bond is determined.

If the bond has a term of less than 4 years on 1 January, then it will be benchmarked to the on-the-run 2yr US Treasury bond for the remainder of the year. If the bond has a term of more than 4 years, but less than 7 years on 1 January, then it will be benchmarked to the on-the-run 5-year US Treasury bond for the remainder of the year. If the bond has a term on 1 January of more than 7 years, but less than 14 years, then it will be benchmarked to the on-the-run 10-year US Treasury bond for the remainder of the year. If the bond has a term on 1 January of more than 14 years, then it will be benchmarked to the on-the-run 30-year US Treasury bond for the remainder of the year.

It is important to note that when new on-the-run bonds are issued, the respective Emerging Market Corporate bonds will be benchmarked to the new on-the-run bond on the dated date of the new benchmark US treasury bond.

European Corporate Bonds

Credit Suisse's suite of European Corporate bond indices are either denominated in euro or in sterling.

For euro denominated bonds, the benchmark is determined on the last business date of the previous month by selecting the fixed-coupon German government bond that has begun accruing interest and has the closest remaining term in absolute number of days. The benchmark bond remains fixed for the month.

For sterling denominated bonds, the benchmark is determined on the last business date of the previous month by selecting the fixed-coupon UK government bond that has begun accruing interest and has the closest remaining term in absolute number of days to the respective corporate bond. The benchmark bond remains fixed for the month.

US dollar denominated corporate and sovereign bonds

Credit Suisse's suite of US dollar denominated corporate bond indices and Emerging Market sovereign bonds all follow the same market conventions for determination of benchmark bonds. The benchmark level to use for each bond is determined each day.

If the bond has a current term of less than 2 years on 1 January, then it will be benchmarked to the on-the-run 2yr US Treasury bond. If the bond has a current term of more than 2 years, but less than 4 years, then it will be benchmarked to the on-the-run 3yr US Treasury bond. If the bond has a current term of more than 4 years, but less than 6 years, then it will be benchmarked to the on-the-run 5-year US Treasury bond. If the bond has a current term on 1 January of more than 6 years, but less than 14 years, then it will be benchmarked to the on-the-run 10-year US Treasury bond. If the bond has a current term of more than 14 years, then it will be benchmarked to the on-the-run 30-year US Treasury bond.

It is important to note that when new on-the-run bonds are issued, the respective USD denominated corporate bonds will be benchmarked to the new on-the-run bond on the dated date of the new benchmark US treasury bond.

US Agency Bonds

Credit Suisse's US Agency indices follow a similar convention to US corporates for determination of benchmark bond, with a few modifications. The benchmark level to use for each bond is determined each day.

If the bond has a current term of less than 2.5 years on 1 January, then it will be benchmarked to the on-the-run 2yr US Treasury bond. If the bond has a current term of more than 2.5 years, but less than 4 years, then it will be benchmarked to the on-the-run 3yr US Treasury bond. If the bond has a current term of more than 4 years, but less than 6 years, then it will be benchmarked to the on-the-run 5-year US Treasury bond. If the bond has a current term on 1 January of more than 6 years, but less than 8 years, then it will be benchmarked to the on-the-run 7-year US Treasury bond. If the bond has a current term on 1 January of more than 8 years, but less than 14 years, then it will be benchmarked to the on-the-run 10-year US Treasury bond. If the bond has a current term of more than 14 years, then it will be benchmarked to the on-the-run 30-year US Treasury bond.

It is important to note that when new on-the-run bonds are issued, the respective USD denominated corporate bonds will be benchmarked to the new on-the-run bond on the dated date of the new benchmark US treasury bond.

Breakeven Bonds

For inflation protected government securities, the breakeven bond is the security used to measure the spread differential between the inflation security and its nominal equivalent.

The determination of the benchmark bond is based on the trading conventions in the relevant bond market. These conventions are not set in stone and may change over time. Credit Suisse reassesses the market conventions periodically and adjusts the logic for determination of benchmarks accordingly in each market.

As of the writing of this publication, the logic for determination of breakeven bond is consistent across all regions.

On the first date that the inflation bond is eligible for inclusion in the index (which is typically the first index rebalance date after the bond was issued), the breakeven bond is selected by choosing the closest maturity fixed-coupon treasury bond, in terms of absolute number of days, in the respective currency. Callable government bonds are excluded from consideration as the breakeven bond.

For euro denominated bonds, only German government bonds are eligible for selection as the breakeven bond.

Yield Measures

The yield of a bond typically refers to the expected return of the bond when held to its maturity or call date.

The methodology for calculating these yields is outlined below.

Please note that all forward-looking measures including yield are not calculated for non-performing bonds.

Yield

For indices that explicitly exclude bonds with optionality, one yield measure is calculated. This yield is equivalent to a yield to maturity.

For indices that do contain bonds with optionality, the yield is equivalent to the yield-to-worst. Some corporate bond indices, including the LUCI, LEI and LSI, for instance, explicitly exclude bonds with optionality but have an exception to permit the inclusion of bonds that are callable at par within 12 months of the final maturity date. The rationale for the exception is that the call feature is considered to be immaterial to the valuation of the bond. The call feature on the bonds in these indices and the yield measure shows a yield-to-maturity.

Yield-to-next

The yield-to-next (YTN) on bonds with optionality calculates the yield of the bond to the next option (call or put) date.

For bonds that do not have a call schedule or a put schedule, the yield-to-next calculation will be identical to the yield-to-maturity calculation.

For bonds that have less than 1 month remaining until the next call date, and no call has been announced, the next call is ignored for the purposes of yield-to-next calculations and the subsequent call date and call price are used.

Yield-to-maturity

The yield-to-maturity is calculated for non-perpetual bonds by using the final maturity date of the bond.

Annual Yield

The annual yield is a yield-to-maturity calculation assuming annual coupon payments.

Semi-annual Yield

The semi-annual yield is a yield-to-maturity calculation assuming semi-annual coupon payments.

Yield-to-2022 and Yield-to-2026

Yield to 2022 and yield to 2026 are calculated on European indices like the BCI, ICI, CoCo indices to reflect the grandfathering period of Basel II towards Basel III and solvency for European insurers.

Worst Date

The worst date is calculated by selecting the date that will result in the lowest yield when calculating a yield to all call dates and to maturity on day 0. Worst date on a bond will remain constant throughout the month to minimize the volatility of yields when the price of a bond deviates between in-the-money and out-of-the-money periods. However, the worst date may change intra-month in some exceptional cases when the calculated yield-to-worst turns negative and thus the next available call date will be chosen as the worst date.

In the event that a call has been announced intra-month, the worst date will be set to the call date for the remainder of the month until the bond is removed from the index. Interest will no longer accrue after the call date.

Street Yield (yield-to-worst)

The street yield on any given date is determined by calculating a yield to the Worst Date, described above. In almost all circumstances, the street yield will be equal to the yield-to- worst date.

One notable difference between street yield and yield-to-worst occurs when a bond is trading in-the-money and it appears that a call will not be exercised by a company for tax, balance sheet or other reasons. In this instance, the next coupon period will be ignored. Street yield may differ from yield-to-worst if the market convention for a given market is to calculate to call date. In many corporate markets in non-Japan Asia, for example, there has been an implicit expectation that calls will be exercised.

The following rules apply for all yield calculations:

- All yield calculations follow local market conventions in terms of the treatment of accrued interest, calendars, ex-dividend periods, settlement conventions and cash flow assumptions.
- For fixed-to-float bonds and FLIRBs, a forward starting swap curve is used to approximate the cash flow schedule in the floating period. For fixed-to-float bonds that have multiple floating legs, the forward starting swap curve is generated based on the floating rate used in the first floating period only. For fixed-to-float perpetuals, an assumed maturity is calculated. This assumed maturity is typically about 85 years from the present day.
- For fixed-to-variable bonds, which have a coupon payment frequency which differs from the coupon reset frequency, forward starting swap curves are also used to calculate future cash flow payments. For fixed-to-variable perpetuals, maturity dates are determined in an identical manner to fixed-to-float perpetuals.
- For fixed-to-fixed perpetuals, yield-to-maturity calculations are not calculated beyond the first call date.
- For bonds with sinking funds, the yield is calculated to average life.
- For hybrid bonds with the option to defer coupon payments, it is always assumed coupon payments will be made unless an announcement is made otherwise.
- Make whole call features are not considered in yield calculations unless a call has been announced. Similarly, event driven calls such as tax changes calls and other calls that are triggered on specific events are ignored for the purpose of this calculation until a call announcement is made.
- For bonds that have a trigger to convert to equity based on an event, the contingent convert feature is ignored for the purposes of yield calculations.
- If a call is announced, all yield calculations will be made to the exercise date. In practice, bonds typically trade at a small discount prior to their call date, which would typically result in extremely high yield calculations as the bond approaches exercise date. To minimize these superficial spikes in yield prior to call date, yields are calculated using the call price (rather than the market price) upon its call announcement, which is about 30 calendar days prior to the call date.
- No yield measures are calculated for distressed and non-performing bonds.

- Limits may be applied to yield calculations on specific indices on an index-by-index basis. These caps are typically only applicable in extreme circumstances when prices drop precipitously over a very short period over time before the bond is marked as non-performing or dropped from the index. For example, a yield limit of 1000% may be applied to certain indices.

Please note that the above rules apply to current index calculations, and may not be applicable for all periods and for all indices, historically. An effort has been made over time to conform to market conventions. For example, prior to the credit crisis in 2008, many bank bonds traded to call date with the assumption that there was limited extension risk beyond the first call date. Even after the debt crisis, some markets, including the corporate bond market in non-Japan Asia, continued to assume bonds would always be called.

Duration Measures

Duration can be described as the weighted average time to receipt of the future cash flows (or coupon payments), with weighting determined by the portion of the bond's overall present value that is represented by the present value of those future cash flows. Duration shows that for small changes in the bond's yield, the percentage change in the bond's price approximates the negative of its duration multiplied by the change in yield. In other words, for small parallel shifts in the yield curve, the ratio of two bonds' price changes will be the same as the ratio of their durations.

Duration is also a concept commonly used to describe the effective life of bonds. It is a method of assessing the risk profile of different bonds regardless of differences in term to expiry, coupon rates and yield to maturity. It is an important concept in the use of interest rate futures for hedging. The duration of a bond is a measure of how long, on average, the holder of the bond has to wait before receiving cash payments. Duration calculation using the conventional yield is often called Macaulay duration:

Macaulay duration

Macaulay duration is defined as:

$$MacDur = \frac{1}{P_d} \times \sum_{1}^{n} t_i CF_i \left(1 + {}^{y_d}/_{freq}\right)^{-t_i}$$

Where Pd is equal to the present value of the expected cash flows, yield (yd) and coupon frequencies (freq), equation with expected cash flows (CFi).

Macaulay duration divided by one plus the conventional yield is often referred to as modified duration. Modified duration can be used like continuously compounded duration to calculate the percentage change in bond price for small changes in yield.

Modified Duration

Modified duration is defined as:

$$ModDur = \frac{MacDur}{\left(1 + {}^{y_d}/_{freq}\right)} = \left(-\frac{1}{P_d}\right)\frac{\partial P_d}{\partial y_d}$$

Mathematically, modified duration represents the slope of the tangent line, at a particular yield level, to the price-yield curve of the bond. At different yield levels, the slope of this tangent line will vary. Modified duration can then be used to measure the price sensitivity of a bond since modified duration always assumes (1) instantaneous yield changes; (2) changes in yield which are small; and (3) parallel shifts in the yield curve. When moderate or large changes in interest rates are considered, a measure known as convexity is sometimes important. Parallel shifts are a serious limitation. In practice, short-term rates are usually more volatile than, and not closely correlated with, long-term rates. From the above ModDur formula, flows the following statement:

Approximate dollar price change

$$\partial P_d = -(ModDur \times P_d)\partial y_d$$

Dollar duration is defined as,

$$DolDur = (ModDur \times P_d)$$

For example, AIG 5.1% 01/17/2007 on May 2, 2002 has ModDur = 4.065, dirty price = 101.279.

The DolDur = 4.065 * $101.279 = $411.699

Approximate dollar price change = - 411.699 * 0.0001= - 0.04117

The sign of dollar price change is not important as the price/yield relationship is well known. The magnitude of the dollar price change is the crucial variable. As mentioned in the duration assumptions, the estimation will be relevant only if the yield change is small.

For bonds with optionality, durations are calculated to worst date. If a call has been announced, durations are calculated to the exercise date.

Convexity

Convexity is a measure of the speed a bond's duration changes as its yield changes. Therefore, the duration of a bond with high convexity will increase as yields fall and decrease as yields rise. This means that for parallel yield shifts of equal size, the price gain on a downward move in yield is larger than the price loss on an upward move. Mathematically, it is the second derivative of price with respect to yield.

Spread over Swap Curve Measures

Asset Swap Spread

An asset swap is an interest rate swap or cross currency swap used to convert the cash flows from an underlying bond, from fixed coupon to floating coupon, floating coupon to fixed coupon, or from one currency to another. The terms and conditions of the asset swap are the same for an interest rate swap or cross currency swap. The underlying security and swap may be transacted as a package, with the same counterparty, or separately with different counterparts. The asset swap may be transacted at the time of the security purchase or added to a bond or FRN already owned by the investor. A Fixed Rate Bond plus an Asset Swap converting the bond to floating rate is known as a Synthetic Floating Rate Note.

The security plus Asset Swap can be sold as a package separately. Depending on the yield of the bond and the swap curve, the asset yields a certain premium in excess of LIBOR, commonly referred to as the asset swap spread.

Spread to Swap Calculation

The swap-spread calculation is based on the following formula:

$$SwapSpread = \frac{PriceFromZero - MktPrice}{\sum dfc_i DCF_i}$$

Where the "PriceFromZero" is the price of the bond calculated using the swap-zero curve, "MktPrice" is the market price of the bond. The prices can be either both clean or dirty prices. DCF_i is the day count fraction for the coupon payment, as computed from the appropriate floating leg conventions (i.e., Act360 on the USD market). dfc_i is the discount factor.

It is important to note that asset swap spread measures are computed to the same date as yield measures. For example, if yield to worst date is calculated for a bond, the asset swap spread is calculated to the worst date, as well. It is also important to note that the asset swap spread is not calculated on floating-rate bonds.

Cross Currency Swap

A cross-currency swap is equivalent to short a vanilla LIBOR swap in the one currency, long a vanilla LIBOR swap in the other currency, and long/short the currency basis swap.

PV_j: Present value of one set of cash-flows in CC_j (j = 1, 2)

CF_j^i: The i-th cash-flow per unit notional in currency j (j = 1, 2)

df_j^i: The discount factor to PV date applied to the i-th cash flow in currency j

FX: The spot FX rate on the PV date

NP_j: The notional of the CCJ_j (j = 1, 2)

The

$$PV_j = NP_j \times \sum_i CF_j^i * df_j^i ; j = 1, 2$$

Since $PV_1 = {}^{PV_2}/_{FX}$

$$NP_1 \times \sum_i CF_1^i * df_1^i = {}^{\left(NP_2 \times \sum_i CF_2^i * df_2^i\right)}/_{FX}$$

By convention, $NP_2 = NP_1 \times FX$

$$\sum_i CF_1^i * df_1^i = \sum_i CF_2^i * df_2^i$$

In asset swap, CF_1^0 is the dirty price of the bond, and CF_1^i with i > 0, are the coupons and the final redemption. CF_2^0 is the initial principal of the floating leg of the swap, and CF_2^i with i > 0, are the (floating coupons + asset swap spread) and the final redemption.

I-Spread

I-spread-to-maturity is calculated by first generating a term LIBOR rate to the maturity of the bond by interpolating along the swap curve. The I-spread is simply the spread between the bond's yield-to-maturity and this term LIBOR rate.

Similarly, the i-spread-to-worst measure is calculated by first generating a term LIBOR rate to the worst date of the bond and finding the difference between the bond's yield-to-worst (or street yield) and this term LIBOR rate. The i-spread-to-next measure is calculated by first generating a term LIBOR rate to the next call (or put) date of the bond and finding the difference between the bond's yield-to-next and this term LIBOR rate.

Z-Spread

The Z-Spread is calculated by generating an implied zero-coupon swap curve, and then discounting all of the cash flows from a bond with these rates. If the bond trades at a price below the price calculated by discounting the cash flows, the zero-coupon swap curve is "bumped" higher (there is a parallel shift in this curve), and the bond price is calculated again. This trial-and-error process is continued until the calculated price equals the market price. The amount that the swap curve was "bumped" is the Z spread. Note that for sinking fund bonds, the Z-Spread is computed to maturity with amortizing legs.

Z-spread-to-worst, Z-spread-to-next, and Z-spread-to-maturity are calculated by discounting all of the cash flow from a bond with the rates from the implied zero-coupon swap curve until the worst date, next coupon date and maturity date, respectively.

Spread over YC

The spread over YC measure is calculated for a given bond by first generating a yield curve of government bonds in the same currency as the bond, using the linear interpolation method, and then calculating the difference between the yield on the bond and the interpolated point along the generated yield curve on the worst date of the bond.

The only difference in methodology for calculating spread over YC measures for bonds in different indices is a slightly different approach to the construction of yield curves in each currency. All curves are constructed using linear interpolation between points, the difference in approach lies in the selection of bonds to be included in the yield curve. The methodology for determining which bonds are used for constructing yield curves is intended to match local market conventions and is subject to change due to modifications of the local government bond markets including, but not limited to, the debt issuance schedule and other changes in the local government bond markets.

As of the time of this writing, the yield curves are calculated as follows for each of the primary index base currencies:

- USD: The yield curve is generated by taking the on-the-run 3-month, 6-month, 2-year, 3-year, 5-year, 7-year, 10-year and 30yr US Treasury bonds.
- JPY: The yield curve is generated by taking the on-the-run 2-year, 5-year, 7-year, 10-year, 20-year, 30-year and 40-year Japan Government bonds.
- EUR: The yield curve is generated by taking all fixed-coupon German government bonds with a balance of 1 billion EUR or greater that have not matured.
- GBP: The yield curve is generated by taking all fixed-coupon UK government bonds with a balance of 1 billion GBP or greater that have not matured.
- NOK: The yield curve is generated by taking all fixed-coupon Norwegian government bonds with a balance of 1 billion NOK or greater that have not matured.
- SEK: The yield curve is generated by taking all fixed-coupon Swedish government bonds with a balance of 1 billion SEK or greater that have not matured.

- DAK: The yield curve is generated by taking all fixed-coupon Danish government bonds with a balance of 1 billion DAK or greater that have not matured.
- CAD: The yield curve is generated by taking all fixed-coupon Canadian government bonds with a balance of 1 billion CAD or greater that have not matured.
- AUD: The yield curve is generated by taking all fixed-coupon Australian government bonds with a balance of 1 billion AUD or greater that have not matured.
- NZD: The yield curve is generated by taking all fixed-coupon New Zealand government bonds with a balance of 1 billion NZD or greater that have not matured.

Label may vary for the Spread to YC measure, for example, it is known as G-spread in LUCI workbench and STW in the USHY workbench.

OAS Spread

The OAS spread measures the spread between the rate of the bond and the risk-free rate of return. In considering both changing interest rates and prepayment risk, the OAS spread allows for comparison between a bond's cash flows and reference rates while valuing embedded options against market volatility.

Index Statistics

All index level (or portfolio level) statistics aggregate the bond level measures by constituent bond market weights. For return related statistics, bonds weights are fixed on the last business date of the previous month. For all other statistics, a bond's weight is defined as daily market weight with monthly fixed par amounts.

w_i: market weight for the ith-bond in the index

For bond i, the market weight $w_i = (price_i + accruedInterest_i) \times paramount_i$

n: total number of bonds in the index

W: total weight for an index

Index's total weight W is calculated as

$$W = \sum_{i=1}^{n} w_i$$

Each bond i has weight of $\omega_i = {}^{w_i}/_{W}$ from a given index.
By given bond's modified duration mi, an index's modified duration, which can be represented as

$$D = \sum_{i=1}^{n} \omega_i * m_i$$

Note: Select measures are fixed for the month in order to simplify data interpretation. For example, a rating change will not take effect until the next month.

Amendment of Index Rules

The Index Sponsor, with the approval of the Index Committee, may supplement, amend (in whole or in part), revise, rebalance or withdraw index rules at any time if one of the following occurs:

(i) there is any event or circumstance that in the determination of the Index Sponsor makes it impossible or impracticable to calculate the Index pursuant to the Index Rules;

(ii) a change to the Index Rules is required to address an error, ambiguity or omission; or

(iii) the Index Sponsor determines that an Extraordinary Event has occurred.

A supplement, amendment, revision, rebalancing or withdrawal may lead to a change in the way the Index is calculated or constructed. Such changes may include, without limitation, substitution of a bond or index rebalancing on a date other than a Rebalance Date. "Extraordinary Event" means any of the following events or circumstances:

a) change in either (i) the liquidity of any bond in the index, or (ii) the trading volume;

b) change in any applicable law or regulation, or any decision or promulgation of any change in the interpretation by any court, tribunal or regulatory authority of any applicable law or regulation;

c) any event or circumstance that means the value of a bond in the index is, in the determination of the Index Sponsor, unreliable;

d) any event that, in the determination of the Index Sponsor, has a material adverse effect on the ability of the Index Sponsor (or any of its affiliates) to establish, maintain, value, rebalance or unwind a hedge position in relation to an investment product linked to the Index; or

e) any other event which, in the sole determination of the Index Sponsor, either (i) has a material impact on the ability of the Index Calculation Agent or Index Sponsor to perform its duties, or (ii) in the sole determination of the Index Calculation Agent, serves to frustrate the purpose or aims of the Index Methodology or (iii) constitutes commercially reasonable grounds for the termination of the Index.

which, in the case of each of (a) – (e) above, has or will have a material effect on the Index as determined by the Index Sponsor, acting in good faith and a commercially reasonable manner.

Following any withdrawal of the Index as described above, the Index Sponsor may replace the Index with a successor index and/or replace the Index Strategy with a similar successor strategy or an entirely new strategy at any time, as it deems appropriate through consultation with the Index Committee.

Handling of Index Errors

Credit Suisse endeavors to provide the most accurate historical returns and statistics as possible. When errors are noted on the current Index Level, Credit Suisse will make a best effort to address and correct the levels within one Index Calculation Day of its publication. When historical errors are detected, the necessary change will be classified as either immaterial or material. How that classification is determined and the procedures that will be followed in the case of a restatement are detailed below.

Since all bond indices are calculated using month-to-date returns, errors in return calculations that occur only intra-month are self-correcting over time – i.e., the impact on compounded total, excess and price return levels are isolated to the affected dates and do not impact current index levels or index levels going forward. In this case, in which the error in returns calculations is limited in scope to intra-month dates, the change will generally be considered immaterial, and the Index Sponsor, in consultation with the Index Calculation Agent, will determine whether a restatement of only the impacted dates is warranted (intra-month restatements may be deemed necessary, for example, in cases in which errors in bond prices were found or incorrect reference data was used).

Errors that impact forward-looking measures (including yields, durations, spreads and all forward-looking measures outlined in this document) or bond index statistics but not index levels or returns calculations will also generally be considered immaterial. In the event that a sub-component, or breakdown, of the broader index is determined to be inaccurate due to a misclassification of a bond, the usage of the sub-indices will be considered by the Index Committee in their determination of materiality.

If an error impacts returns at month-end, and therefore impacts compounded total, price or excess returns, then the Index Committee will generally consider this to be a material change and will be brought to the Index Approval Committee to determine if a re-statement is required. When the Committee concludes that a restatement is required and the change is material, then a restatement announcement will be disseminated via a publication prior to the restatement. Restatement announcements, once they are published, are final and are not open to commentary or discussion. It is the responsibility of all interested parties to subscribe to Credit Suisse's publications. Non-material index errors will not be brought to the Index Approval Committee. Notification of non-material restatements may not be broadly disseminated.

Suspension of the Index

Index Disruption

Where, in the determination of the Index Calculation Agent, an Index Disruption Event has occurred or is existing and subsisting in respect to any Index Calculation Day (a "Disrupted Day"), the Index Calculation Agent may in respect of such Disrupted Day (i) suspend the calculation and publication of the Index Value and/or (ii) determine the Index Value on the basis of estimated or adjusted data and publish an estimated level of the Index Value and/or, the Index Calculation Agent may, following such Disrupted Day, take any action including but not limited to designation of alternative price sources or reconstitution of the Index.

Index Disruption Events

In the determination of the Index Sponsor, the following events are each an "Index Disruption Event":

a) a closure of the money markets relating to the currency in which the index is denominated or any other relevant currency as determined by the Index Calculation Agent other than for ordinary public holidays, or a restriction or suspension in trading in these markets that would materially impact any determination required in the construction or calculation of the Index and the Index Value;

b) the failure, suspension or postponement of any calculation within the Index Strategy in respect of any Index Calculation Day, any event resulting in a breakdown in any means of communication or a procedure normally used to enable the determination of the Index Value, any other event, in the determination of the Index Calculation Agent preventing the prompt or accurate determination of the Index Value, or the Index Calculation Agent concludes that as a consequence of any such event that the last reported Index Value should not be relied upon; and

c) the occurrence, in respect of any security, option, futures contract, derivative or foreign exchange contract or other instrument referenced in the calculation of the Index, of

(i) any suspension of or limitation imposed on trading by any relevant exchange or other trading facility, (ii) the closure of any relevant exchange or other trading facility before its scheduled closing time, or (iii) any other event that materially disrupts or impairs, as determined by the Index Sponsor acting in good faith and a commercially reasonable manner, the ability of market participants in general to effect transactions in, or obtain market values for, a bond in the index.

Review of the Index Rules and Procedures

The Index Committee will periodically review all Bond Index families as well as these Index Rules at least once annually.

Disclaimer and Legal Considerations

The following disclaimer and legal comments address considerations for indexes above and beyond the scope of considerations pertaining to strategist's related materials and publications. For more details on the disclaimers and legal considerations applicable to strategist's publication, please refer to the disclaimers at the bottom of this document.

General Trading in Markets tracked by the index

Trading and other transactions by Credit Suisse International ("CSi") and/or its affiliates in the bonds comprising an Index may affect the value of such Index, and there may be conflicts of interest between investors in such Index and CSi and/or its affiliates.

CSi and/or its affiliates actively trade bonds in the Indexes. CSi and/or its affiliates also actively enter into or trade and market securities, swaps, options, derivatives, and related instruments which are linked to the performance of these bonds. CSi and/or its affiliates may underwrite or issue other securities or financial instruments indexed to the Index, and CSi or its affiliates may license the Index for publication or for use by unaffiliated third parties. These activities could present conflicts of interest and could affect the value of the Index. For instance, a market maker in a financial instrument linked to the performance of the Index may expect to hedge some or all of its position in that financial instrument. Purchase (or selling) activity in the bonds included in the Index in order to hedge the market maker's position in the financial instrument may affect the market price of such bonds included in the Index, which in turn may affect the value of the Index.

Except as required by applicable law and regulation, with respect to any of the activities described above, neither CSi nor its affiliates has any obligation to take the needs of any investors in the Index into consideration at any time.

Pricing Sources used by the index

The Index Calculation Agent uses third party vendor pricing as the independent source to calculate bond indices that are administered by Credit Suisse.

Discretionary Inputs

Categorization and Classification

The Index Calculation Agent makes every effort to use third party data sources for the determination of categorizations for the inclusion of bonds in the various sub-indices wherever possible.

When a reliable external data source is available, for example for ratings, amount outstanding, maturity, term and subordination sub-indices, the Index Calculation Agent will use the external data sources as the primary source for determination of the classification of a bond. However, the Index Calculation Agent may choose to supplement the data with internal data sources to improve the quality of the data or to extend the granularity of the data; for example, the Index Calculation Agent considers Credit Suisse's own ratings on some Swiss bonds and further delineates tiers into step up and non-step bonds.

In certain instances, the Index Calculation Agent maintains the right to override the values provided by data vendors if they are deemed to be inaccurate. For example, the Index Calculation Agent may determine that the country classification of a bond issuer provided by vendors is inconsistent with the primary country of risk for that particular issue.

Where a reliable external data source is not available, the Index Calculation Agent will determine the classification in its sole discretion, using the expert judgment of its strategists and the most accurate information available to them. An example of this would be the sector sub-indices or the categorization of bonds as quasi-sovereign rather than corporate or sovereign.

More details on any subjective elements in the classification of sub-indices can be found in the Index specific reports.

Terms and Conditions of Bond Index Constituents

The Index Calculation Agent uses 3rd party data sources for terms and conditions which are necessary inputs for the calculations of Index levels as well as related analytics including yields and spreads.

In the rare event that vendor data are deemed to be inaccurate or not representative of current market conditions, the Index Calculation Agent may use the expert judgment and knowledge of the markets of its strategists to override data that are provided by external vendors for individual securities for specific time periods. This includes, but is not limited to, assumptions on whether calls will be exercised, assumptions on whether coupon payments will be deferred, assumptions on cash flow schedules for hybrid and pay-in-kind securities, and assumptions on the likelihood of a bond coupon payment in the event that an issuer is in distress or about to default.

Modifications to the terms and conditions of bond index constituents can have a material impact on Index levels.

US Credit Strategy
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Backtested, hypothetical or simulated performance results have inherent limitations, some of which are described below. Unlike an actual performance record based on trading actual client portfolios, backtested, hypothetical or simulated results are achieved by means of the retroactive application of a backtested model itself designed with the benefit of hindsight. Backtested performance does not reflect the impact that material economic or market factors might have on an adviser's decision-making process if the adviser were actually managing a client's portfolio. The backtesting of performance differs from actual account performance because the investment strategy may be adjusted at any time, for any reason, and can continue to be changed until desired or better performance results are achieved. The backtested performance includes hypothetical results that do not reflect the reinvestment of dividends and other earnings or the deduction of advisory fees, brokerage or other commissions, and any other expenses that a client would have paid or actually paid. No representation is made that any account will or is likely to achieve profits or losses similar to those shown. Alternative modeling techniques or assumptions might produce significantly different results and prove to be more appropriate. Past hypothetical backtest results are neither an indicator nor guarantee of future returns. In fact, there are frequently sharp differences between hypothetical performance results and the actual results subsequently achieved. Actual results will vary, perhaps materially, from the analysis. In addition, hypothetical trading does not involve financial risk, and no hypothetical trading record can completely account for the impact of financial risk in actual trading. For example, the ability to withstand losses or to adhere to a particular trading program in spite of trading losses are material points which can also adversely affect actual trading results. There are numerous other factors related to the markets in general or to the implementation of any specific trading program which cannot be fully accounted for in the preparation of hypothetical performance results and all of which can adversely affect actual trading results. As a sophisticated investor, you accept and agree to use such information only for the purpose of discussing with Credit Suisse your preliminary interest in investing in the strategy described herein.

HOLT

The HOLT methodology does not assign ratings or a target price to a security. It is an analytical tool that involves use of a set of proprietary quantitative algorithms and warranted value calculations, collectively called the HOLT valuation model, that are consistently applied to all the companies included in its database. Third-party data (including consensus earnings estimates) are systematically translated into a number of default variables and incorporated into the algorithms available in the HOLT valuation model. The source financial statement, pricing, and earnings data provided by outside data vendors are subject to quality control and may also be adjusted to more closely measure the underlying economics of firm performance. These adjustments provide consistency when analyzing a single company across time, or analyzing multiple companies across industries or national borders. The default scenario that is produced by the HOLT valuation model establishes a warranted price for a security, and as the third-party data are updated, the warranted price may also change. The default variables may also be adjusted to produce alternative warranted prices, any of which could occur. The warranted price is an algorithmic output applied systematically across all companies based on historical levels and volatility of returns. Additional information about the HOLT methodology is available on request.

Structured Products

Structured securities are complex instruments, typically involve a high degree of risk and are intended for sale only to sophisticated investors who are capable of understanding and assuming the risks involved. The market value of any structured security may be affected by changes in economic, financial and political factors (including, but not limited to, spot and forward interest and exchange rates), time to maturity, market conditions and volatility, and the credit quality of any issuer or reference issuer. Any investor interested in purchasing a structured product should conduct their own investigation and analysis of the product and consult with their own professional advisers as to the risks involved in making such a purchase.

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Risks

1. Call or Put Purchasing: The risk of purchasing a call/put is that you will lose the entire premium paid.
2. Uncovered Call Writing: The risk of selling an uncovered call is unlimited and may result in losses significantly greater than the premium received.
3. Uncovered Put Writing: The risk of selling an uncovered put is significant and may result in losses significantly greater than the premium received.
4. Call or Put Vertical Spread Purchasing (same expiration month for both options): The basic risk of effecting a long spread transaction is limited to the premium paid when the position is established.
5. Call or Put Vertical Spread Writing (same expiration month for both options): The basic risk of effecting a short spread transaction is limited to the difference between the strike prices less the amount received in premiums.

6. Call or Put Calendar Spread Purchasing (different expiration months & short must expire prior to the long): The basic risk of effecting a long calendar spread transaction is limited to the premium paid when the position is established.

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