

## OAD

Updated: 15 Feb 2017

Use the scalar valued function [OAD](#) to return the option-adjusted effective duration for a corporate bond with a call or put option schedule.

The effective duration is derived by calculating the option-adjusted spread and then using the [PriceFromIRLattice](#) using a continuously compounded zero coupon based on par curve that has been shifted up and down by some small number of basis points. The shifted curves and the delta (the amount by which the curves were shifted) are passed into the function.

The effective duration is calculated as

$$OAD = \frac{(V_- - V_+)}{(2 * V_0 * \delta)}$$

Where

$V_0$  = value of the bond

$V_-$  = value of the bond using the  $V_0$  OAS and the par curve shifted down by  $d$

$V_+$  = value of the bond using the  $V_0$  OAS and the par curve shifted up by  $d$

$d$  = amount by which the par curve is shifted (.0001 = 1 basis point).

### Syntax

'METHOD: OAD (1a/2) - numeric rate / datatable

```
Public Shared Function OAD(  
    ByVal Settlement As Date,  
    ByVal Maturity As Date,  
    ByVal Rate As Double,  
    ByVal Price As Double,  
    ByVal Redemption As Double,  
    ByVal Frequency As Integer,  
    ByVal Basis As String,  
    ByVal LastCouponDate As Date,  
    ByVal FirstCouponDate As Date,  
    ByVal IssueDate As Date,  
    ByVal CCZero As System.Data.DataTable,  
    ByVal CurveType As String,  
    ByVal CurveStartDate As Date,  
    ByVal CurveDayCount As String,  
    ByVal CurveFrequency As Integer,  
    ByVal CurveInterpMethod As String,  
    ByVal Vol As Double,  
    ByVal OptionSched As System.Data.DataTable,  
    Optional ByVal delta As Double = 0.0025)
```

'METHOD: OAD (1b/2) - numeric rate / 2d-array

```
Public Shared Function OAD(  
    ByVal Settlement As Date,  
    ByVal Maturity As Date,
```

```
ByVal Rate As Object,  
ByVal Price As Double,  
ByVal Redemption As Double,  
ByVal Frequency As Integer,  
ByVal Basis As String,  
ByVal LastCouponDate As Date,  
ByVal FirstCouponDate As Date,  
ByVal IssueDate As Date,  
ByVal CCZero As System.Array,  
ByVal CurveType As String,  
ByVal CurveStartDate As Date,  
ByVal CurveDayCount As String,  
ByVal CurveFrequency As Integer,  
ByVal CurveInterpMethod As String,  
ByVal Vol As Double,  
ByVal OptionSched As System.Array,  
Optional ByVal delta As Double = 0.0025)
```

'METHOD: OAD (1c/2) - numeric rate / ILists

```
Public Shared Function OAD(  
    ByVal Settlement As Date,  
    ByVal Maturity As Date,  
    ByVal Rate As Double,  
    ByVal Price As Double,  
    ByVal Redemption As Double,  
    ByVal Frequency As Integer,  
    ByVal Basis As String,  
    ByVal LastCouponDate As Date,  
    ByVal FirstCouponDate As Date,  
    ByVal IssueDate As Date,  
    ByVal CCZero_T As IList(Of Double), _  
    ByVal CCZero_Rates As IList(Of Double), _  
    ByVal CurveType As String,  
    ByVal CurveStartDate As Date,  
    ByVal CurveDayCount As String,  
    ByVal CurveFrequency As Integer,  
    ByVal CurveInterpMethod As String,  
    ByVal Vol As Double,  
    ByVal OptionSched_Date As IList(Of Date),  
    ByVal OptionSched_Price As IList(Of Double),  
    ByVal OptionSched_CallPut As IList(Of String),  
    Optional ByVal delta As Double = 0.0025)
```

'METHOD: OAD (2a/2) - stepped rate / datatable

```
Public Shared Function OAD(  
    ByVal Settlement As Date,  
    ByVal Maturity As Date,  
    ByVal StepRates As System.Data.DataTable,  
    ByVal Price As Double,  
    ByVal Redemption As Double,  
    ByVal Frequency As Integer,  
    ByVal Basis As String,  
    ByVal LastCouponDate As Date,  
    ByVal FirstCouponDate As Date,  
    ByVal IssueDate As Date,
```

```
ByVal CCZero As System.Data.DataTable,  
ByVal CurveType As String,  
ByVal CurveStartDate As Date,  
ByVal CurveDayCount As String,  
ByVal CurveFrequency As Integer,  
ByVal CurveInterpMethod As String,  
ByVal Vol As Double,  
ByVal OptionSched As System.Data.DataTable,  
Optional ByVal delta As Double = 0.0025)
```

'METHOD: OAD (2b/2) - stepped rate / 2d-array

```
Public Shared Function OAD(  
    ByVal Settlement As Date,  
    ByVal Maturity As Date,  
    ByVal StepRates As System.Array,  
    ByVal Price As Double,  
    ByVal Redemption As Double,  
    ByVal Frequency As Integer,  
    ByVal Basis As String,  
    ByVal LastCouponDate As Date,  
    ByVal FirstCouponDate As Date,  
    ByVal IssueDate As Date,  
    ByVal CCZero As System.Array,  
    ByVal CurveType As String,  
    ByVal CurveStartDate As Date,  
    ByVal CurveDayCount As String,  
    ByVal CurveFrequency As Integer,  
    ByVal CurveInterpMethod As String,  
    ByVal Vol As Double,  
    ByVal OptionSched As System.Array,  
    Optional ByVal delta As Double = 0.0025)
```

'METHOD: OAD (2c/2) - stepped rate / ILists

```
Public Shared Function OAD(  
    ByVal Settlement As Date,  
    ByVal Maturity As Date,  
    ByVal DateStep As IList(Of Date),  
    ByVal RateStep As IList(Of Double),  
    ByVal Price As Double,  
    ByVal Redemption As Double,  
    ByVal Frequency As Integer,  
    ByVal Basis As String,  
    ByVal LastCouponDate As Date,  
    ByVal FirstCouponDate As Date,  
    ByVal IssueDate As Date,  
    ByVal CCZero_T As IList(Of Double), _  
    ByVal CCZero_Rates As IList(Of Double), _  
    ByVal CurveType As String,  
    ByVal CurveStartDate As Date,  
    ByVal CurveDayCount As String,  
    ByVal CurveFrequency As Integer,  
    ByVal CurveInterpMethod As String,  
    ByVal Vol As Double,  
    ByVal OptionSched_Date As IList(Of Date),  
    ByVal OptionSched_Price As IList(Of Double),
```

```
ByVal OptionSched_CallPut As IList(Of String),  
Optional ByVal delta As Double = 0.0025)
```

## Arguments

### *Settlement*

the Settlement date of the bond. *Settlement* is an expression that returns a **Date**, or of a type that can be implicitly converted to **Date**.

### *Maturity*

the Maturity date of the bond. *Maturity* is an expression that returns a **Date**, or of a type that can be implicitly converted to **Date**.

### *Rate*

the coupon rate of the bond (.01 = 1%). *Rate* is an expression that returns a **Double**, or of a type that can be implicitly converted to **Double**.

### *StepRates*

for stepped-rate bonds, a the coupon start dates and the associated coupon rates. *StepRates* contains 2 data columns, where the first column contains the coupon start dates and the second column contains the corresponding coupon rates, where 1% = .01. *Rates* is an expression that returns a **2-dimensional array of Object** (col,row) or a **System.Data.DataTable** where the first column contains **Date** values, or values of types that can be implicitly converted to **Date**, and the second column contains **Double** values, or values of types that can be implicitly converted to **Double**.

### *DateStep*

for stepped-rate bonds, the coupon start dates, to correspond with rates from *RateStep*. *DateStep* is an expression that implements **IList(Of Double)**.

### *RateStep*

for stepped-rate bonds, the coupon rates associated with the *DateStep* dates. *RateStep* is an expression that implements **IList(Of Double)**.

### *Price*

the (clean) price of the bond. *Price* is an expression that returns a **Double**, or of a type that can be implicitly converted to **Double**.

### *Redemption*

the redemption value of the bond. *Redemption* is an expression that returns a **Double**, or of a type that can be implicitly converted to **Double**.

### *Frequency*

the coupon frequency of the bond; the number of times that the coupon interest is paid per year. *Frequency* is an expression that returns a **Double**, or of a type that can be implicitly converted to **Double**.

#### *Basis*

the Interest basis code for the bond; the day-count convention used in the calculation of the accrued interest. *Basis* is an expression that returns a **String**, or of a type that can be implicitly converted to **String**.

#### *LastCouponDate*

for bonds where the last coupon period is either longer or shorter than the regular coupon period, the last coupon date prior to the maturity date. *LastCouponDate* is an expression that returns a **Date**, or of a type that can be implicitly converted to **Date**.

#### *FirstCouponDate*

for bonds where the first coupon period is either longer or shorter than a regular coupon period, the date of the first coupon payment. *FirstCouponDate* is an expression that returns a **Date**, or of a type that can be implicitly converted to **Date**.

#### *IssueDate*

for bonds where the first coupon period is either longer or short than a regular coupon period, the start date for the first period coupon interest. *IssueDate* is an expression that returns a **Date**, or of a type that can be implicitly converted to **Date**.

#### *CCZero*

the time in years and the rates to be used in the OAS calculation. *CCZero* contains 2 data columns, where the first column contains the time in years and the second column the corresponding rates, where 1% = .01. *CCZero* is an expression that returns a **2-dimensional array of Object** (col,row) or a **System.Data.DataTable** where the first column contains **Double** values, or values of types that can be implicitly converted to **Double**, and the second column contains **Double** values, or values of types that can be implicitly converted to **Double**.

#### *CCZero\_T*

the time in years to be used in the OAS calculation, corresponds with dates from *CCZero\_Rates*. *CCZero\_T* is an expression that implements **IList(Of Double)**.

#### *CCZero\_Rates*

the rates to be used in the OAS calculation, corresponds with dates from *CCZero\_T*. *CCZero\_Rates* is an expression that implements **IList(Of Double)**.

#### *CurveType*

identifies the curve in *CCZero* as either a spot curve (S) or a continuously compounded zero coupon curve (CC). Valid values are ('S', 'CC'). *CurveType* is an expression that returns a **String**, or of a type that can be implicitly converted to **String**.

### *CurveStartDate*

the start date for the curve; used to calculate the time-in-years associated with the coupon dates. *CurveStartDate* is an expression that returns a **Date**, or of a type that can be implicitly converted to **Date**.

### *CurveDayCount*

the day-count convention used in calculating the time-in-years associated with the coupon dates. Valid values are (0,1,2,3,4,21); see YEARFRAC documentation for more details. *CurveDayCount* is an expression that returns a **String**, or of a type that can be implicitly converted to **String**.

### *CurveFrequency*

the compounding frequency used in the calculation of the discount factors when the supplied curve is the spot curve. Valid Values are (1,2,4). *CurveFrequency* is an expression that returns a **Integer**, or of a type that can be implicitly converted to **Integer**.

### *CurveInterpMethod*

the interpolation method to calculate the rate associated with the coupon dates; use 'L' for linear interpolation and 'S' for cubic spline interpolation. *CurveInterpMethod* is an expression that returns a **String**, or of a type that can be implicitly converted to **String**.

### *Vol*

the volatility associated with the forward rates where 1% = .01. *Vol* is an expression that returns a **Double**, or of a type that can be implicitly converted to **Double**.

### *OptionSched*

the exercise dates, the strike prices, and call / put indicators ('P' or 'C'). *OptionSched* contains 3 data columns, where the first column contains the exercise dates, the second column the corresponding strike prices, and the third column the corresponding call / put indicators. *OptionSched* is an expression that returns a **2-dimensional array of Object** (col,row) or a **System.Data.DataTable** where the first column contains **Date** values, or values of types that can be implicitly converted to **Date**, the second column contains **Double** values, or values of types that can be implicitly converted to **Double**, and the third column contains **String** values, or values of types that can be implicitly converted to **String**.

### *OptionSched\_Date*

the exercise dates, corresponds with strike prices and call / put indicators from *OptionSched\_Price* and *OptionSched\_CallPut*. *OptionSched\_Date* is an expression that implements **IList(Of Date)**.

### *OptionSched\_Price*

the strike prices, corresponds with exercise dates and call / put indicators from *OptionSched\_Date* and *OptionSched\_CallPut*. *OptionSched\_Price* is an expression that implements **IList(Of Double)**.

### *OptionSched\_CallPut*

the call / put indicators ('P' or 'C'), corresponds with exercise dates and strike prices from *OptionSched\_Date* and *OptionSched\_Price*. *OptionSched\_CallPut* is an expression that implements **IList(Of String)**.

### *delta*

the shift applied to the supplied curve where .0001 = 1 basis point. *delta* is an expression that returns a **Double**, or of a type that can be implicitly converted to **Double**.

## Return Type

Double

## Remarks

- If Settlement is NULL then Settlement = today
- If Maturity is NULL then Maturity = today
- If Rate is NULL then Rate = 0
- If Price is NULL then Price = 0
- If CurveSpread is NULL then CurveSpread = 0
- If Redemption is NULL then Redemption = 100
- If Frequency is NULL then Frequency = 2
- If Basis is NULL then Basis = '0'
- If CurveType is NULL then CurveType = 'CC'
- If CurveStartDate is NULL then CurveStartDate = Settlement
- If CurveDayCount is NULL then CurveDayCount = 1
- If CurveFrequency is NULL then CurveFrequency = 2
- If CurveInterpMethod is NULL then CurveInterpMethod = 'S'

## Examples

Find examples that illustrate how to call this function in the [demo application](#) bundled with the [XLeratorDLL trial download](#).

## See Also

- BondPriceFromZeroes – Bond pricing from the zero coupon curve
- CMTCurve - Constant Maturity Treasury curve
- LogNormalIRLattice - LogNormal Interest Rate Lattice
- OAC - Option Adjusted Convexity
- OAS - Option Adjusted Spread
- PriceFromIRLattice - Bond Pricing using Option Adjusted Spread
- PriceFromZeroesTVF - Zero Volatility spread details

- ZSPREAD - Zero volatility spread.