

PRICEFR

Updated: 31 Mar 2016

Use **PRICEFR** to calculate the price from yield of a bond with a forced redemption schedule where the coupon payment dates occur at regular periods and the redemptions can occur on any coupon date. The formula for the price of a bond with a forced redemption schedule with more than one period to maturity is:

$$\text{PRICE} = \frac{P}{P - \sum_{j=1}^M \text{FR}_j} \times \left[\sum_{k=1}^N \frac{C_k + \text{FR}_k}{\left(1 + \frac{Y}{F}\right)^{k-1 + \frac{\text{DSC}}{E}}} - \left(P - \sum_{j=1}^M \text{FR}_j \right) \times \frac{R}{F} \times \frac{A}{E} \right]$$

Where:

- A = Number of days from previous coupon date to settlement date
- C = Coupon Amount
- DSC = Number of days from settlement date to the next coupon date
- E = Number of days in the current coupon period
- F = Number of coupon payments per year
- FR = Forced Redemption amount
- M = Number of forced redemptions on or before the previous coupon date
- N = Number of coupons from the settlement to the maturity date
- P = Par Value
- R = Annual interest rate in decimal terms (10% = 0.10)
- Y = Annual yield in decimal terms (10% = 0.10)

The coupon payments can vary over the life of the bond as they are affected by the forced redemption schedule. Coupon payments are calculated as

$$C_k = \left(P - \sum_{j=1}^{k-1} \text{FR}_j \right) \times \frac{R}{F}$$

Where:

- C_k = Coupon payment number k
- F = Number of coupon payments per year
- FR = Forced redemption amount
- P = Par value
- R = Annual rate of interest in decimal terms

If the settlement date is in the final coupon period, then the formula for the calculation of price is:

$$\text{PRICE} = P \times \left[\frac{1 + \frac{R}{F}}{1 + \left(\frac{\text{DSR}}{E} \times \frac{Y}{F} \right)} - \left(\frac{A}{E} \times \frac{R}{F} \right) \right]$$

Where:

- A = Number of days from previous coupon date to settlement date
- DSR = Number of days from settlement date to maturity date
- E = Number of days in the current coupon period
- F = Number of coupon payments per year
- R = Annual interest rate in decimal terms (10% = 0.10)
- P = Par Value
- Y = Annual yield in decimal terms (10% = 0.10)

Syntax

```
Public Shared Function PRICEFR(  
    ByVal Settlement As Date,  
    ByVal Maturity As Date,  
    ByVal Rate As Double,  
    ByVal Par As Double,  
    ByVal Yield As Double,  
    ByVal Frequency As Double,  
    ByVal Basis As String,  
    ByVal Repayments As String,)
```

Arguments

Settlement

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

Rate

the security's annual coupon rate. *Rate* is an expression that returns a **Double**, or of a type that can be implicitly converted to **Double**.

Par

the par value of the security. All forced redemptions are subtracted from the par value on the redemption date and the adjusted balance is used in calculating the subsequent coupon interest. *Par* is an expression that returns a **Double**, or of a type that can be implicitly converted to **Double**.

Yield

the security's annual yield. *Yield* is an expression that returns a **Double**, or of a type that can be implicitly converted to **Double**.

Frequency

the number of coupon payments per year. For annual payments, *Frequency* = 1; for semi-annual, *Frequency* = 2; for quarterly, *Frequency* = 4; for monthly, *Frequency* = 12. For bonds with Basis = "A/364" or 9, you can enter 364 for payments made every 52 weeks, 182 for payments made every 26 weeks, 91 for payments made every 13 weeks, 28 for payments made every 4 weeks,

14 for payments made every 2 weeks, and 7 for weekly payments. *Frequency* is an expression that returns a **Double**, or of a type that can be implicitly converted to **Double**.

Basis

the type of day count to use.

| Basis | Day count basis |
|---|-----------------------------------|
| 0, "BOND" | US (NASD) 30/360 |
| 1, "ACTUAL" | Actual/Actual |
| 2, "A360" | Actual/360 |
| 3, "A365" | Actual/365 |
| 4, "30E/360 (ISDA)", "30E/360", "ISDA", "30E/360 ISDA", "EBOND" | European 30/360 |
| 5, "30/360", "30/360 ISDA", "GERMAN" | 30/360 ISDA |
| 6, "NL/ACT" | No Leap Year/ACT |
| 7, "NL/365" | No Leap Year /365 |
| 8, "NL/360" | No Leap Year /360 |
| 9, "A/364" | Actual/364 |
| 10, "BOND NON-EOM" | US (NASD) 30/360 non-end-of-month |
| 11, "ACTUAL NON-EOM" | Actual/Actual non-end-of-month |
| 12, "A360 NON-EOM" | Actual/360 non-end-of-month |
| 13, "A365 NON-EOM" | Actual/365 non-end-of-month |
| 14, "30E/360 NON-EOM", "30E/360 ICMA NON-EOM", "EBOND NON-EOM" | European 30/360 non-end-of-month |
| 15, "30/360 NON-EOM", "30/360 ISDA NON-EOM", "GERMAN NON-EOM" | 30/360 ISDA non-end-of-month |
| 16, "NL/ACT NON-EOM" | No Leap Year/ACT non-end-of-month |
| 17, "NL/365 NON-EOM" | No Leap Year/365 non-end-of-month |
| 18, "NL/360 NON-EOM" | No Leap Year/360 non-end-of-month |
| 19, "A/364 NON-EOM" | Actual/364 non-end-of-month |

Basis is an expression that returns a **String**, or of a type that can be implicitly converted to **String**.

Repayments

a SELECT statement, as a string, which identifies the coupon dates and the forced redemption amounts to be used in the price calculation. *Repayments* is an expression that returns a **String**, or of a type that can be implicitly converted to **String**.

Return Type

Double

Remarks

- If *Basis* is invalid then an error is returned.
- If *Frequency* is invalid then an error is returned.
- If *Maturity* < *Settlement* then NULL is returned.
- If *Repayments* returns no rows then NULL is returned.
- If *Settlement* is NULL, *Settlement* equals the current system processing date.
- If *Frequency* is NULL, *Frequency* = 2.
- If *Basis* is NULL, *Basis* = 0.
- PRICEFR forces the principal balance of the bond to zero at maturity.
- If *Par* is NULL then *Par* = 100.
- If *Rate* is NULL then *Rate* = 0.
- If *Yield* is NULL then *Yield* = 0.
- If *Maturity* is NULL then a NULL is returned.

See Also

- BONDCF - Cash flows for a bond paying regular periodic interest
- DIRTYPRICE - Dirty price of a bond
- DIRTYYIELD - Yield of a bond from the dirty price
- DIS - Price, discount rate, and/or yield of a discount security
- DISC - Discount rate
- DISFACTORS - Factors for the price calculation of a discount security
- IAM - Price and/or yield of a security paying interest at maturity
- IAMFACTORS - Factors for the price calculation of a security paying interest at maturity
- ODDFPRICE - Price of a bond with an odd first coupon
- ODDFYIELD - Yield of a bond with an odd first coupon
- ODDLPRICE - Price of a bond with an odd last coupon
- ODDLyield - Yield of a bond with an odd last coupon
- OFC - Calculate the price and/or yield of a bond with an odd first coupon using the ODDFPRICE equation
- OFCFACTORS - Returns the components of the ODDFPRICE equation
- OFL - Calculate the price and/or yield of a bond with an odd first and an odd last coupon using the OFLPRICE equation
- OFLFACTORS - Returns the components of the OFLPRICE equation
- OFLPRICE - Calculate the price of a security with an odd first and odd last period
- OFLYIELD - Calculate the yield of a security with an odd first and odd last period
- OLC - Calculate the price and/or yield of a bond with an odd last coupon using the ODDLPRICE equation
- OLCFACTORS - Returns the components of the ODDLPRICE equation
- PRICE - Price of a security paying regular periodic interest
- PRICEACT - Price of a bond where coupon amounts are based on number of days in the coupon period

- PRICEACTV - Cash flows and discount factors for a bond where coupon amounts are based on number of days in the coupon period
- PRICEDISC - Price of a discounted security
- PRICEMAT - Price of an interest-at-maturity security
- PRICESTEP - Price of a security with step-up rates
- RPI - Calculate the price and/or yield of a bond with regular periodic coupons
- RPIFACTORS - Factors for the calculation of the price of a bond that pays regular periodic interest
- TBILLEQ - Bond equivalent yield of a Treasury Bill
- TBILLPRICE - Price of a Treasury Bill
- TBILLYIELD - Yield of a Treasury Bill
- YIELD - Yield of a bond paying regular periodic interest
- YIELDACT - Yield of a bond where coupon amounts are based on number of days in the coupon period
- YELDDISC - Yield on a discount security
- YELDFR - Yield of a bond with forced redemptions
- YELDMAT - Yield on an interest-at-maturity security
- YIELDSTEP - Yield of a security with step-up rates