**Annex 6**

## Important Excel functions for bond related calculations

| ***Function*** | ***Syntax*** |
|---|---|
| **1. Present Value** | **PV(rate,nper,pmt,fv,type)** |

*This function is used to find the present value of a series of future payments given the discount rate. This forms the basis for pricing a bond*

Rate is the interest rate per period.

Nper is the total number of payment periods in an annuity.

Pmt is the payment made each period and cannot change over the life of the annuity.

Fv is the future value, or a cash balance you want to attain after the last payment is made. If fv is omitted, it is assumed to be 0 (the future value of a loan, for example, is 0).

Type is the number 0 or 1 and indicates when payments are due.

| **Set type equal to** | **If payments are due** |
|---|---|
| 0 or omitted | At the end of the period |
| 1 | At the beginning of the period |

**Example**: To calculate the present value of ₹100 after every year for three years at an interest rate of 9%, the values would be;

Rate – 9% or 0.09; Nper – 3 (3 years); Pmt – 100; Fv – 0 as there is no balance left at the end of three years; Type – 0 (at the end of the period)

The answer would be **253.13**

| **2. Future Value** | **FV(rate,nper,pmt,pv,type)** |
|---|---|

*This function is used to calculate the future value of a series of investments made, given the interest rate.*

Rate is the interest rate per period.

Nper is the total number of payment periods in an annuity.

Pmt is the payment made each period; it cannot change over the life of the annuity. Typically, pmt contains principal and interest but no other fees or taxes. If pmt is omitted, you must include the pv argument.

Pv is the present value, or the lump-sum amount that a series of future payments is worth right now. If pv is omitted, it is assumed to be 0 (zero), and you must include the pmt argument.

Type is the number 0 or 1 and indicates when payments are due. If type is omitted, it is assumed to be 0.

**Example**: To calculate the future value of ₹100 paid every year for three years at an interest

rate of 9%, the values would be;

Rate – 9% or 0.09; Nper – 3 (3 years); Pmt – 100; Pv – 0 as there is no lumpsum payment at the beginning; Type – 1 (at the beginning of the period)The answer would be **357.31**

| **3. Coupon days** | **COUPDAYBS(settlement,maturity,frequency,basis)** |
|---|---|

*This function is used to workout the number of days from the beginning to the end of the coupon period that contains the settlement date.*

Settlement is the security's settlement date. The security settlement date is the date after the issue date when the security is traded to the buyer.

Maturity is the security's maturity date. The maturity date is the date when the security expires.

Frequency is the number of coupon payments per year. For annual payments, frequency = 1; for semiannual, frequency = 2; for quarterly, frequency = 4.

Basis is the type of day count basis to use. Appropriate code for the day count convention has to be provided as shown below;

| **Basis** | **Day count basis** | **Basis** | **Day count basis** |
|---|---|---|---|
| 0 or omitted | US (NASD) 30/360 | 3 | Actual/365 |
| 1 | Actual/actual | 4 | European 30/360 |
| 2 | Actual/360 | | |

**Example**: In the case of security maturing on February 2, 2019, and settlement date May 27, 2009, the values in the formula would be;

Maturity – 2/2/2019; settlement – 27/5/2009; frequency – 2 (half yearly coupon) and basis – 4 (day count convention 30/360)

The result would be **180** (number of coupon days in the coupon period)

| **4. Yearfrac** | **YEARFRAC(start_date,end_date,basis) (to find residual maturity)** |
|---|---|

*This function is used to find the residual maturity of a security in years.*

Start_date is a date that represents the start date.

End_date is a date that represents the end date (maturity date).

Basis is the type of day count basis to use (0=US system 30/360, 2=Actual/actual, 3=Actual/365, 4=European style 30/360( (thus 0 or 4 throws same value).

**Example**: For a security maturing on February 6, 2019, the residual maturity in number of years as on May 27, 2009 can be calculated as;

Start date – May 27, 2009; End date – Feb 2, 2019, basis – 4

The result would be **9.68 years**

| **5. PRICE** | **PRICE(settlement,maturity,rate,yld,redemption,frequency,basis)** |
|---|---|

*This function is used to find the price of security that pays periodic interest.*

Settlement is the security's settlement date. The security settlement date is the date on which the security and funds are exchanged.

Maturity is the security's maturity date. The maturity date is the date when the security expires.

Rate is the security's annual coupon rate.

Yld is the security's annual yield.

Redemption is the security's redemption value per ₹100 face value.

Frequency is the number of coupon payments per year. For annual payments, frequency = 1; for semiannual, frequency = 2; for quarterly, frequency = 4.

Basis is the type of day count basis to use.

**Example**: 6.05%2019 security maturing on February 2, 2019. It is yielding 6.68% in secondary market on June 1, 2009. Settlement date is June 2, 2009. Values in the price formula would be;

Settlement – 2/6/2009; maturity – 2/2/2019; rate – 6.05%; Yield – 6.68%; Redemption – 100 (face value); frequency – 2 (half yearly coupon); basis – 4. The result would be **95.55**

| **6. YIELD** | **YIELD(settlement,maturity,rate,pr,redemption,frequency,basis)** |
|---|---|

*This function is used to find the Yield to Maturity of a security given the price of the security.*

Settlement is the security's settlement date. The security settlement date is the date on which the security and funds are exchanged. Maturity is the security's maturity date. The maturity date is the date when the security expires.

Rate is the security's annual coupon rate.

Pr is the security's price per ₹100 face value.

Redemption is the security's redemption value per ₹100 face value.

Frequency is the number of coupon payments per year. For annual payments, frequency = 1; for semiannual, frequency = 2; for quarterly, frequency = 4.

Basis is the type of day count basis to use.

Taking the same example as above, and price at 95.55, the result for the yield would be **6.68%.**

| **7. DURATION** | **DURATION(settlement,maturity,coupon,yld,frequency,basis)** |
|---|---|

*This function is used to find the Duration of a security in number of years.*

Settlement is the security's settlement date. The security settlement date is the date on which the security and funds are exchanged. Maturity is the security's maturity date. The maturity date is the date when the security expires.

Coupon is the security's annual coupon rate.

Yld is the security's annual yield.

Frequency is the number of coupon payments per year. For annual payments, frequency =

1; for semiannual, frequency = 2; for quarterly, frequency = 4.

Basis is the type of day count basis to use.

**Example**: 6.05%2019 security maturing on February 2, 2019. It is yielding 6.68% in secondary market on June 1, 2009. Settlement date is June 2, 2009. Values in the Duration formula would be;

Settlement – 2/6/2009; maturity – 2/2/2019; Coupon – 6.05%; Yield – 6.68%; frequency – 2 (half yearly coupon); basis – 4.

The result will be 7.25 years.

| **8. Modified Duration** | **MDURATION(settlement,maturity,coupon,yld,frequency,basis)** |
|---|---|

*This function is used to calculate the Modified Duration of a security.*

Settlement is the security's settlement date. The security settlement date is the date on which the security and funds are exchanged. Maturity is the security's maturity date. The maturity date is the date when the security expires.

Coupon is the security's annual coupon rate.

Yld is the security's annual yield.

Frequency is the number of coupon payments per year. For annual payments, frequency = 1; for semiannual, frequency = 2; for quarterly, frequency = 4.

Basis is the type of day count basis to use.

Taking the same example given above for Duration and feeding the values in the excel function, the formula result will be 7.01