

## Financial Functions in Excel

1. **NPV** (Net Present Value) of the cash flow  $C_1, C_2, \dots, C_n$  with the interest rate  $r$  (per period):

$$\text{NPV} = \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \dots + \frac{C_n}{(1+r)^n}$$

Excel name: **NPV**

Excel arguments: **Rate** – interest rate  $r$  per period

**Value1** - cash flow  $C_1, C_2, \dots, C_n$

*Note: Cash flows start at period 1 here. If you have a cash flow at time 0, add it manually. If you do not have cash flow during some periods, you must enter zero – otherwise Excel ignores the time period.*

**Value2** – optional (never used in this class)

2. **IRR** (Internal Rate of Return) of the cash flow  $-C_0, C_1, C_2, \dots, C_n$ . IRR finds an interest rate  $r$  (per period) that solves the equation:

$$C_0 = \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \dots + \frac{C_n}{(1+r)^n}$$

Excel name: **IRR**

Excel arguments: **Values** - cash flow  $-C_0, C_1, C_2, \dots, C_n$

*Note: Make sure that the cash flow at time zero is negative.*

**Guess** – your best guess of what IRR might be (usually a small positive number like 0.01 (1%))

3. **Yield y** of the bond that makes coupon payments **k** times per year over **n** periods in the amount **C**, and has a face value (or redemption value) **V**. Yield finds the value **y** that solves the equation:

$$\text{Price} = \frac{C}{\left(1 + \frac{y}{k}\right)^1} + \frac{C}{\left(1 + \frac{y}{k}\right)^2} + \dots + \frac{C + V}{\left(1 + \frac{y}{k}\right)^n}$$

*Note: The **Yield** function in Excel corresponds to the Bond Equivalent Yield (BEY) in the case of semi-annual payments.*

Excel name: **Yield**

Excel arguments: **Settlement** – bond settlement date

**Maturity** – bond expiration date

*Note: If you are only given time to maturity, choose settlement and maturity dates to match the time to expiration.*

**Rate** – bond annual coupon rate

**Pr** – current bond price per \$100 face value

**Redemption** – bond redemption value at maturity per \$100 face value

**Frequency** – number of coupon payments per year

**Basis** - optional (never used in this class)

4. **Price** of the bond that has the current yield **y**, makes coupon payments **k** times per year over **n** periods in the amount **C**, and has a face value (or redemption value) **V**. The bond price is given by

$$\text{Price} = \frac{C}{\left(1 + \frac{y}{k}\right)^1} + \frac{C}{\left(1 + \frac{y}{k}\right)^2} + \dots + \frac{C + V}{\left(1 + \frac{y}{k}\right)^n}$$

Excel name: **Price**

Excel arguments: **Settlement** – bond settlement date

**Maturity** – bond expiration date

*Note: If you are only given time to maturity, choose settlement and maturity dates to match the time to expiration.*

**Rate** – bond annual coupon rate

**Yld** – current bond annual yield

**Redemption** – bond redemption value at maturity per \$100 face value

**Frequency** – number of coupon payments per year

**Basis** - optional (never used in this class)

5. **Macaulay Duration ( $D$ )** of the bond with the current price  $P$ , and the present value of the period  $j$  coupon given by  $PVC_j$  :

$$D = \frac{1 \times PVC_1}{P} + \frac{2 \times PVC_2}{P} + \dots + \frac{n \times PVC_n}{P}$$

Excel name: **Duration**

Excel arguments: **Settlement** – bond settlement date

**Maturity** – bond expiration date

*Note: If you are only given time to maturity, choose settlement and maturity dates to match the time to expiration.*

**Coupon** – bond annual coupon rate

**Yld** – current bond annual yield

*Note: Excel does not use the current bond price  $P$ , but uses the current bond yield.*

**Frequency** – number of coupon payments per year

**Basis** - optional (never used in this class)

6. **Modified Duration ( $D^*$ )** of the bond with the Macaulay duration  $D$ , current yield  $y$ , and number of coupon payments per year  $k$ :

$$D^* = \frac{D}{\left(1 + \frac{y}{k}\right)}$$

Excel name: **MDuration**

Excel arguments: **Settlement** – bond settlement date

**Maturity** – bond expiration date

*Note: If you are only given time to maturity, choose settlement and maturity dates to match the time to expiration.*

**Coupon** – bond annual coupon rate

**Yld** – current bond annual yield

*Note: Excel does not use the Macaulay duration, but uses the current bond yield, and the number of payments per year.*

**Frequency** – number of coupon payments per year

**Basis** - optional (never used in this class)